The United States MILLER

Published by E. HARRISON CAWKER. { Vol. 15, No. 2. } MILWAUKEE, JUNE. 1883. { Terms: $1.00 a Year in Advance Single Copies, 10 Cents.

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(For The United States Miller.)

CEREALS.

The *cerealia*, a genus of the family *graminex*, derives its name from Ceres, the goddess of corn, and is the most important to man of all those into which vegetables have been divided. It consists of several species, all bearing a strong natural affinity to each other, and all resting their claims, as articles of nourishment, on the quantity of farinaceous or starchy matter which their seeds contain. To this family also belong the grasses, so necessary for the support of herbivorous animals, especially those of the domestic kind, as also the sugar-cane, which furnishes another important article of diet.

The principal plants forming the cerealia are wheat, rye, barley, oats, millet, rice, maize or indian corn; other cereal grasses, possessing the same farinaceous properties, are neglected only on account of the smallness of the seed. Every civilized nation, from the earliest records, has sedulously cultivated grain. In the sepulchres of the most ancient of the Egyptian monarchs, which have been explored by modern travellers, was found the common wheat, in vessels which were so perfectly closed, that the grains retained both their form and color. The wheat, buried there for several thousand years, affords a proof of the ancient civilization of Egypt as convincing as the ruins of temples and the inscriptions of obelisks. And yet, what is sufficiently singular, the corn plants, such as they are found under cultivation, do not grow wild in any part of the earth. Wheat has been traced, indeed in Persia, springing up in spots very remote from human habitation, and out of the line of the traffic of the natives; but this circumstance is far from proving that it is a production natural and indigenous to Persia. Other seeds are dispersed throughout the earth by winds and currents, and various other ways, but the corn plants in common with many other important vegetable productions, follow the course of man alone. The manner in which the most imported gifts of Providence to mankind have been diffused by the influence of conquest or commerce, has some striking instances in the history of America. None of the cereal grasses, properly so called, were found in cultivation among the Mexicans when their country was first visited by Europeans. The foundation of the wheat harvests at Mexico is said to have been three or four grains, which a slave of *Cortes* discovered in 1530, accidently mixed with a quantity of rice. The rice of Carolina is now the principal produce of that portion of the United States. Mr. Ashby, an English merchant, at the close of the 17th century, sent a hundred weight from China to this colony; and from this source all the subsequent rice harvests of that division of the new world, and the large exportations of the same valuable grain to Europe, have sprung. Facts such as these are highly interesting, because they exhibit the moral as well as the natural causes which influence the distribution of vegetable food throughout the earth.

Before describing the different kind of corn, it may be interesting to take a general view of their cultivation over the globe. The utmost northern limit of the culture of grain in Siberia reaches to 60° of latitude; and in the more eastern parts of the province these important products are scarcely to be met with higher than 55°. In the more southern parts of Siberia and in districts adjoining the Wolga, the land is exceedingly fertile, so that crops of grain are obtained with a very trifling amount of labor. Buckwheat is very commonly cultivated in this district, and it is found that one sowing of the seed will produce five or six crops in as many successive years, each harvest yielding from twelve to fifteen times the quantity first sown, Europe is indebted to Siberia for a particular description of oats, which are considered excellent; and at Yakoutch barley is sometimes seen to arrive at maturity. Barley and oats are the kinds of grain the culture of which extends furthest to the north. Rye follows next in order, being associated with oats and barley in the more northern division of the temperate zone. In the southern part of Norway and Sweden, in Denmark, in districts bordering on the Baltic sea and in the north of Germany, rye forms the principal object of cultivation, barley being raised in those countries, as with us, merely for the purpose of brewing, and the oats being limited chiefly to the feeding of horses. In all these last mentioned places wheat is also grown; but its consumption is limited, and the principal part is made an object of internal trade. In Sweden agriculture is pursued in a systematic and scientific manner, by which means the natural barrenness of the soil is in a considerable degree remedied—the province of Gothland producing barley, oats, rye and wheat, as well as pease and beans. Somewhat farther to the south rye in a great measure disappears, and wheat becomes the principal grain used for human food. France, England, part of Germany and Hungary, and the lands of western and middle Asia, fall within this description. In most of these countries the vine is also successfully cultivated, and wine forming a substitute for beer, the raising of barley is consequently much neglected. Still farther southward wheat is found in abundance, but maize and rice are also produced, and enter largely into the constituents of human food. Portugal, Spain, that part of France which borders on the Mediterranean sea, Italy and Greece, are thus circumstanced. Still farther to east, in Persia and northern India, Arabia, Nubia, Egypt and Barbary, wheat is indeed found; but maize, rice, and millet form the principal materials for human sustenance. In the United States wheat, rye and maize grow as in the more temperate regions of Europe and in the southern parts of the Union rice also is very largely cultivated. In Australia, wheat also forms the principal object of cultivation on the part of the settlers, but in the southernmost portions of that vast island or rather continent, and in Van Diemen's land, barley and rye are likewise to be found!

Wheat, *Triticum*, perhaps the most valuable of all the cerealia, is an annual herbaceous plant, possessing the usual characteristics of the gramineæ. Two sorts of wheat are cultivated in this country, *triticum hybernum*, or winter wheat, and *triticum æstivum*, spring or summer wheat. The former has a large plump ear, smooth or destitute of awn, with a conspicuous bloom, and a strong vigorous and erect stem. It is sown in autumn, begins to vegetate and remains green during the winter, and comes to maturity towards the end of the following summer. It is very apt to pass into varieties, arising from soil, climate, and modes of culture. Two of the most marked of them are the red and white wheat. Spring wheat, supposed to have come from the north of Europe, is less hardy than the winter wheat, the stem is more slender and delicate, the ear thinner and drooping, and furnished with beards and awns. According to the analysis of Sir H. Davy the nutritive quality of this kind is not quite equal to that of winter wheat, the proportions being 95½ per cent. in the latter, and only 94 per cent. in the former, of the entire bulk of the grains. The gluten contained in the two kinds varies in a greater degree, that of winter wheat being 24 while that of spring wheat is only 19, so that the winter variety is more eligible for the purpose of the baker.

Rye, *Secale cereale*. This grain has an appearance something intermediate between wheat and barley. The ear is bearded, and the stem tall and slender. Four species of this plant are enumerated, *Secale villosum*, *orientale*, *creticum* and *cereale*. The *Secale cereale* is said to be a native of Candia. With the exception of wheat, rye contains a greater proportion of gluten than any of the cereal grains, to which fact is owing its capability of being converted into a spongy bread. It contains, likewise, nearly five parts in every hundred of ready-formed saccharine matter, and is in consequence easily converted into malt and thence into beer or ardent spirit. Rye is the common bread-corn in all the sandy districts to the south of the Baltic sea and the Gulf of Finland, furnishing abundance of food for the numerous inhabitants of places which, without it, must have been little better than sandy and uninhabited deserts. This grain, to which so many human beings are thus indebted for aliment, is subject to a disease which, when it occurs, not only deprives it of all its useful properties as food, but renders it absolutely noxious, and, it may even be said, poisonous to man. Whenever this disease has been witnessed, it has usually happened that a wet spring has been succeeded by a summer more than ordinarily hot. *Tissot*, a French physician, bestowed much attention on this subject, and it is from him we learn that the excrescence, which the grain then bear, is an irregular vegetation, which springs from the middle substance, between the grain and the leaf, growing to the length of an inch and a half and being two-tenth of an inch broad. It is of a brownish color.

Barley, *Hordeum*. This species of grain has a seed of a slenderer from, and a rougher covering or husk than that of wheat; the awn too is larger and more serrated than any of the other species of corn. Barley differs still more from wheat in containing more farina or starch, much less gluten, and about 7 per cent. of combined saccharine matter, which latter wheat does not possess previous to germination—There are four distinct species of barley, besides numerous varieties: *hordeum vulgare* or spring barley; *hordeum hexasticon*, winter or square barley; *hordeum distichon*, long-eared barley; *hordeum zeocriton*, sprat or battledore barley. In one respect barley is of more importance to mankind that wheat. It may be propagated over a wider range of climate, bearing heat and drought better, growing upon lighter soils, and coming so quickly to maturity, that the short northern summers, which do not admit of the ripening of wheat, are yet of long enough duration for the perfection of barley. It is the latest sown and the earliest reaped of all the summer grains. In warm countries, such as Spain, the farmers can gather two harvests of barley within the year, one in the spring from winter-sown grain, and the other in autumn from that sown in summer. The property of not requiring moisture admirably fits barley for propagation in those northern countries, where the duration of summer is limited to a very few months in the year, and where wet is of very rare occurence from the time when the spring rains are over. The purposes to which barley is principally applied are those of brewing and distilling. Some portion is still brought more directly into consumption as human food; but this portion, for the most part, now undergoes the previous process of decortication (removal of the bark,) whereby it is converted into what is called pearl-barley.

Oats. *Avena*. This grain differs in its external appearance from wheat, barley, or rye, especially in the form of the ear. The ear is a panicle formed by the rachis, dividing into numerous branches, the large ones being at the base, while towards the top they gradually decrease, thus forming a conical or tapering figure. While the ear is yet recent the branches are erect, but as the seeds advance towards maturity, and become full and heavy, they assume a dependent form. By this position the air and light has more free access to the ripening grains, while the rain washes off the eggs or larvæ of insect that would otherwise prey upon the young seeds. From these circumstances, as well as from the nature of the plant generally, oats are found to be of such a hardy nature as to thrive in soils and climates where the other grains cannot be raised. The nutritive quality of oats is smaller in a given weight than that of any other cereal grains. In oats of the best quality it does not exceed 75 per cent., while that of wheat is 95½ per cent. The very small proportion of saccharine matter ready formed in oats renders it very diffident and unprofitable to convert this grain into malt.

Rice. *Oryza sativa*. This is a panicled grass, bearing, when in ear a nearer resemblance to barley than to any other of the corn-plants. The seed grows on separate pedicles, springing from the main stalk, each grain is terminated with an awn or beard, and is enclosed in a rough yellow husk, the whole forming a spiked panicle. The stalk is not unlike that of wheat, but the joints are more numerous. The farina of rice is almost entirely composed of starch, having little or no gluten, and being without any ready formed saccharine matter.

There is little reason for doubting that this grain is of Asiatic origin. From the earliest record it has formed the principal, if not the only, food of the great mass of the population on the continent and islands of India and throughout the Chinese empire. The introduction of rice as an object of cultivation in America is of modern occurrence. The swamps of South Carolina, both those which are caused by the inland floodings of the rivers, are well suited for the production of rice; and not only is the cultivation accomplished with trifling labor, but the grain proves of a remarkably fine quality, being decidedly larger and handsomer than that of the countries whence the seed was originally derived. Rice is sown in Carolina in rows in the bottom of trenches. The sowing is for the most part completed by the middle of March. The rice harvest usually commences at the end of August and extends through the entire month of September, or even somewhat later.

Reported Brewery Opening.—We don't send any more reporters down to brewery openings from this paper if we know it. Last Thursday's experiment flooded us with valuable experience. We engaged a young man who recites poems at the temperance meetings on Sunday evenings, and told him to give us a full report of the Fredericksburg brewery by telegraph if necessary. This is what we got:

"Calaboose, San Jose, Thursday evening. Your man locked up on three charges of assault and battery, drunk and disorderly, resisting the police, vulgar language and malicious mischief. Signed, ——, Chief of Police."

The next man that wants to represent the *News Letter* at any convivial gathering must bring a written certificate, signed by at least three saloon keepers, that he is a good reliable hard-drinker, who can stand up in front of a bar all night and write a good solid article about the depreciation of silver afterward. There are plenty of such men to be had, but we missed it this time.—*San Francisco News Letter.*

APHORISMS FROM THE QUARTERS.

(From the Century Bric a-Brac,)

Your luck aint always ekul to de lenk o' your fishin pole.

Grass don't grow high roun' de corn-crib.

De man aint put togedder right dat don't lub his own dorg.

It takes a hones' miller to keep lean shotes.

Don't kill de old goose in sight o' de fedder-bed.

De full moon is a po' han' to keep secrets.

Old hen got 'nough l'arnin' to tell her own chillun in de dark. J. A. Macon.

UNITED STATES MILLER.

PUBLISHED MONTHLY.

OFFICE Nos. 116 & 118 GRAND AVENUE, MILWAUKEE, WIS.

Subscription Price.....$1 per year in advance.
Foreign Subscription.....$1.50 per year in advance.

MILWAUKEE, JUNE, 1883.

ANOUNCEMENT:

☞WM. DUNHAM, *Editor of "The Miller," 69 Mark Lane, and* HENRY F. GILLIG & Co., *449 Strand, London, England are authorized to receive subscriptions for the* UNITED STATES MILLER.

We send out monthly a large number of sample copies of the UNITED STATES MILLER to millers who are not subscribers. We wish them to consider the receipt of a sample copy as a cordial invitation to them to become regular subscribers. Send us One Dollar in money or stamps, and we will send THE UNITED STATES MILLER to you for one year.

☞ *The United States Consuls in various parts of the world who receive this paper, will please oblige the publishers and manufacturers advertising therein, by placing it in their offices where it can be seen by those parties seeking such information as it may contain. We shall be highly gratified to receive communications for publication from Consuls or Consular Agents everywhere, and we believe that such letters will be read with interest, and will be highly appreciated.*

NOTICE—NINTH ANNUAL CONVENTION.

SECRETARY'S OFFICE, MILWAUKEE, WIS., May 16, '83.

The next ANNUAL Meeting of the Millers' National Association will be held in the GRAND PACIFIC HOTEL, CHICAGO, commencing Tuesday, June 26, 1883.

EVERY MEMBER should *make it his business* to be at this meeting. Make it manifest by your presence that you appreciate an association that has saved its members more money, in *dollars and cents*, than any other organization ever formed in this country, and the "grist isn't half ground out." While there may not be as much "*desperate*" business on hand as usual, there are still important matters to claim your attention. Let it be a grand re-union to celebrate victories won—renew old acquaintances, and make new ones "Outsiders" may join, by making application to the Secretary and accepting the terms offered at the Cleveland convention, viz. $5.00 per unit capacity—Membership fee, and the assessment ($10 per unit) for 1883.

ORDER OF BUSINESS.

1st. Opening of the Convention, 11 o'clock A. M.
2nd. Report of Committee on Credentials.
3rd. Proceedings of Last Convention.
4th. Enrollment of members.
5th. Official Report.
6th. Call of Standing Committees and Filling Vacancies.
7th. Appointment of Committee on Nomination of Officers.
8th. Reports of Standing Committees.
9th. Reports from Special Committees.
10th. General Business.
11th. Reports of Committee on Nominations, and Election of Officers for the ensuing year.

S. H. SEAMANS,
Secretary and Treasurer.

NOTICE.

MILLERS' NATIONAL ASSOCIATION.

Secretary's Office, Milwaukee, Wis., May 5th, 1883.

Mr. Julius Schlesinger, Secretary Milwaukee Dust Collector Manufacturing Co., Milwaukee, Wis.

DEAR SIR:—Your favor of yesterday, giving official notice that arrangements are concluded whereby purchasers of your machines are fully protected under all the patents of Messrs. Kirk & Fender, The Geo. T. Smith & Co., and J. L. Bean, which, with the Prinz patents, cover fully all known devices of importance necessary to a successful Dust Collector—and I see no reason why this arrangement will not be perfectly satisfactory and acceptable to our members, as well as millers at large. I congratulate you upon this "Master Stroke" which enables you to furnish a successful machine that carries with it a perfect title to the purchaser. My own experience with your machine warrants a favorable expression as to its merits, and your policy to protect purchasers is worthy the consideration of other manufacturers.

Yours truly,
S. H. SEAMANS, Sec'y.

Mr. Henry Hamper, who ably represents Messrs. Howes, Babcock and Ewell, Silver Creek, N. Y., made the UNITED STATES MILER a pleasant call.

Mr. Seamans, Secretary of the Millers National Association, in his recent report on the "condition and outlook of the wheat crop &c" —estimates, that from present indications, the yield from 21 states, representing nearly all the wheat producing area in the United States, for the present year will be 373,500,000 bushels indicating a prospective shortage from 1882 crop of nearly 93,000,000 bushels in same states.

We are in receipt of a copy of Sec'y Seaman's Crop Report, issued under the auspices of the Miller's National Association, showing the Condition and Outlook of the Wheat Crop May 16th, in the principal Wheat Area of the United States. It covers 14 pages of closely printed matter making the most complete report we have seen, and gives evidence of a large amount of labor in its compilation, which must be of great value to members of the Association.

S. W. Tallmadge, of Milwaukee, has compiled the following table, showing the annual production of wheat and corn in the United States for the past twenty years:

Year.	Wheat bu.	Corn bu.
1863	178,677,900	397,889,200
1864	160,695,800	530,451,400
1865	148,552,800	704,427,800
1866	151,999,900	867,946,800
1867	212,441,400	768,320,000
1868	224,036,600	906,527,000
1869	260,146,900	874,320,000
1870	285,884 700	1,094,235,000
1871	230,722,400	991,898,000
1872	249,997,100	1,092,719,000
1873	281,254,700	932,274,000
1874	309,102,700	850,148,500
1875	292,136,000	1,321,069,000
1876	289,356,500	1,283,827,000
1877	364,194,100	1,342,558,000
1878	420,122,400	1,888,218,700
1879	448,756,680	1,547,901,790
1880	498,549,868	1,717,434,543
1881	383,280,090	1,194,916,000
1882	504,185,470	1,617,025,100

Average Wheat ..... 292,000,000 bushels.
Average Corn..... 1,071,000,000 "

Average production past five years:

Wheat ..... 451,000,000 bushels.
Corn..... 1,480,000,000 "

The *Roller Mill* Buffalo, N. Y., says in regard to the Downton suit: "The defense was entrusted entirely to a German lawyer, representing the Wegmann interest until the Miller's Association appeared in the case at the urgent solicitation of a well known Manufacturing Company in this State."

It is true that the Manufacturing Co. alluded to paid half of the fees of counsel employed by the Millers' National Association, and are entitled to much credit therefore, but it is a *fact* that to our knowledge the Secretary of the Millers' National Association discovered the condition of the defense and called the attention of the balance of the Executive Committee thereto in May of last year, and the correspondence with the firm alluded to in regard to the matter did not *commence* until August 1882.

A UNITED STATES SUPREME COURT DECISION ON OPTIONS.

Justice Miller of the United States Supreme Court at Washington, D. C., rendered a decision, April 16, on the case of John H. Rountree, plaintiff in error *vs.* Ernest F. Smith and M. C. Lightner, brokers on the Chicago Board of Trade. This case was an appeal from the decision of the Circuit Court of the United States for the Western District of Wisconsin, wherein the brokers sued and obtained judgment against plaintiff for margins due the former on dealings for the latter in pork, lard, wheat, etc., in the Chicago market. The appeal was based on the grounds that these dealings were purely speculative on the part of the brokers, who did not intend to actually buy or sell the products, but to settle by margins, and were therefore illegal. The plaintiff failed to show that the particular contracts in controversy were of this nature, but reasoned on the general fact claimed that the very large proportion of the business on the Board was of the nature of betting. The Court held that what other people intented by similar contracts, however numerous, is not sufficient to prove that the parties to these contracts intended to violate the law or justify a jury in making such a presumption. Besides, in this case the Court said the original plaintiffs were not suing on the contracts, but for services performed and money advanced for defendant at his own request, and thought under some circumstances they might be affected by the morality of the contract. They are certainly not in the same position as the party suing for enforcement of the original agreement. The decision of the court below was affirmed with interest.

GRAIN STORAGE IN MILWAUKEE.

The total grain storage capacity of the elevators of Milwaukee in 1882 was 5,530,000 bushels; receiving capacity 580,000 bushels, and shipping capacity 1,000,0000 bushels per day. Five of the elevators are owned and used by the Chicago, Milwaukee & St. Paul Railway Company, having an aggregate capacity of 3,180,000 bushels. Messrs. Angus Smith & Co. own three elevators, with an aggregate capacity of 2,150,000 bushels, built for the use of the Chicago & Northwestern Railway. The Chicago, Milwaukee & St. Paul elevators receive grain from the Wisconsin Central and Milwaukee & Northern Railroads and the Chicago & Northwestern elevators from the Milwaukee, Lake Shore & Western Railway. The Northwestern Marine elevator, 250,000 bushels capacity, receives grain from vessels and teams, and is not connected with any of the railroad tracks. Most of the grain received from ports along the west shore of Lake Michigan, in small cargoes, is discharged at this elevator.

GRAIN ELEVATORS.

Designation of Elevators.	Present Actual Storage Capacity Bush.	Receiving Capacity per day. Bush.	Shipping Capacity per day. Bush.
C, M. & St. P. Ry Co.'s Elevator A...	850,000	90,000	150,000
" B...	650,000	75,000	120,000
" C...	330,000	50,000	80,000
Angus Smith & Co.'s Elevator A...	850,000	40,000	100,000
" E...	1,000,000	100,000	175,000
" D...	300,000	90,000	150,000
" C...	900,000	90,000	150,000
" B...	200,000	25,000	40,000
Northwestern Marine Elevator	250,000	20,000	40,000
Warehouse	200,000		
Total	5,530,000	580,000	1,005,000

The storage charges remain as established in 1877, and for the first ten days or part thereof are 1¼ cents per bushel, and for each additional ten days or part thereof ½ cent per bushel. Winter storage commences on the 20th of November and terminates on the 15th of April. During that period, when 4 cents per bushel shall have accrued at the foregoing rates, the grain is not subject to additional charge. The elevators reserve the right to charge on grain that may become heated or otherwise out of condition, while in store, 1 cent per bushel for every five days or part thereof, to take effect five days after public notice shall have been given. This very seldom occurs. The weigh-master elected by the Chamber of Commerce is authorized to charge for supervising the weighing of grain at the rate of 25 cents per car-load from or into railway cars, and 30 cents per 1000 bushels from elevators into vessels.

POLICY VS. PRINCIPLE.

The late decisions of the U. S. Supreme Court in favor of the Millers' National Association as defenders, suggests to the thinking mind a stirring lesson that should prove a profitable one for future reference, they have shown that that Policy which is defined by Webster as "management or administration based on *temporal* or *material interests* rather than on principles of EQUITY and HONOR," is not in the end profitable or desirable.

Individuals or associations conducting their affairs of business upon this doctrine, cannot command the respect, accorded those who stand firmly upon the platform of a sound business "principle," defined by Webster as "correct opinion consistently directing our actions" while there may be occasionly a case in which "discretion-politic may be the better part of valor" it were best to accept it, only as a last resort. We are moved to write upon this subject from hearing an enthusiastic member of the millers' association exclaim, after hearing the decisions in the Denchfield and Downton cases—"what a glorious record the association would have made if they had only fought *all* their suits to the "last ditch" regardless of cost."

It is unfortunate that the fact exists, but as it was a matter between the association and its members only, it seems to have been *nearly* unanimous, and must have been satisfactory, and as much as we might feel like condemning such a policy under ordinary circumstances, in these cases, we feel more like surrounding them with the "mantle of charity" for the provocation to do as they did do, was no doubt in our minds, induced by the policy adopted by those equally interested who were not members, but who would be reaping equal benefits without contributing to the funds necessary to make the defenses that have been made. A policy we believe to be unprofitable in the end no matter how much outsiders may save for the time being. We believe that every miller, large or small, in this country should have been ready at the "sound of the bugle" to "fight the common enemy"—whether directly effected or not.

We believe, if the Miller's Association were disbanded to-day, that individual millers would pay out more money within a year for worthless claims or litigations than all the assessments levied to the present time; this is our opinion, and such a course would be contrary to our principles, were we a miller. It may be "policy" to settle a fraud, if by so doing money is saved—but it's a poor principle to follow. It may be "policy" to make your neighbors pay your obligations—when you are able to pay yourself—to protect himself. A "policy," all things to all men may do in politics, but in the every-day business affairs of life, give us that "policy" founded upon principles of "CORRECT OPINION CONSISTENTLY DIRECTING OUR ACTIONS."

(Translated for THE UNITED STATES MILLER.)

SULPHURIC ACID AS A REMEDY AGAINST RUST IN WHEAT.

The use of sulphate of copper is a well-known and reliable remedy against rust, than which there is no more dangerous enemy to wheat; but there are some difficulties connected with its employment. As such, we note a decrease in the germinating power of the grain, which will be the result if the solution is too concentrated or left too long in contact with the grain. Besides, it takes a long time to dry grain, steeped in this solution.

By employing sulphureous acid, the effect of which upon the grain is just as powerful and the proceedings less difficult, the above mentioned inconveniencies are avoided. The procedure is as follows: From the bung-hole of the empty barrel a burning thread dipped in sulphur is suspended, containing sufficient sulphur to consume all the oxygen in the barrel, its entire consumption being indicated by the extinguishment of the fire. The wheat is then introduced through a funnel, covered with a linen cloth, in order to keep the gas from escaping, until one-half or two-thirds of the barrel is filled, when the barrel is again sulphurated in the same way as before. By rolling the barrel three or four hours, if it contains a smaller quantity of grain, or six hours, if a larger quantity, all of the grain is brought into contact with the sulphureous gas, which, if there is much grain in the barrel must again be introduced into it after three hours manipulation. During the operation the grain is kept in a dry condition, and as nothing is lost in its germinating power this method is more convenient than the old way, where sulphate of copper is used. The sulphureous acid is also an excellent agency for preserving barley from rust and other diseases having their origin in the formation of fungi—*Deutsche Muller Zeitung.*

WIRE AND IRON.

Another Valuable Addition to the Manufacturing Interests of Detroit.

The E.T. Barnum Wire and Iron Works now employ nearly 400 people, and when the new factory is completed they will furnish employment to fully 600. Ground for the new factory was broken on the 15th of November, and so rapidly has the work been pushed that the foundations are now completed. The company expect to occupy their new quarters before the 1st of March next. The new works will cover two half blocks, fronting on Howard street and running back to Marquette street along Wabash avenue. The main buildings will be of brick, three stories high, and basement under all.

The works will be quadrangular in form. The Howard street front will be 140 feet in length. The right wing will extend 300 feet along Wabash avenue, while the left wing will be 250 feet long. Each of the wings is 50 feet wide. In the rear of the right wing will be a large blacksmith shop. At the end of the wing, running twenty feet along Wabash avenue, will be an iron foundry. A switch track from the Michigan Central Railroad will enter the works. Some idea of the extent of the building will be gained when it is stated that they will have more than 130,000 square feet of floor surface.

Into this new factory will be put the most complete machinery for the manufacture of iron work for jails, stable furniture, in fact all descriptions of iron work used for building purposes, as well as wire work and useful and ornamental articles in wire and iron. The trade of this company extends all over this country. In Europe iron work of this description is crude and has not reached the degree of artistic perfection which it has in this country. The E. T. Barnum Wire and Iron Works will soon be the largest and best equipped institution of the kind in the United States, and the firm are building up a large business abroad.—*Post and Tribune.*

SECRETARY SEAMANS SPEAKS.

Editor Northwestern Miller:

I note with interest your comments in regard to the recent favorable decisions given by the U. S. Supreme Court whereby millions of dollars are saved to the millers of the country. These were *great victories.* I think many do not realize the extent, or importance thereof, as they would, had they been upon the "rack" these many years watching every move, contesting every step, of a vigorous and determined adversary. In short, had they enjoyed the pleasures of being a member of that awful "star chamber committee," and danced attendance to the demands upon their time, in season and out of season, for nearly six years; under such circumstances they would appreciate the relief of that committee upon receiving Mr. Harding's message conveying the welcome news: "Supreme Court decided Denchfield case in our favor; orders decree to be reserved and bill dismissed." While our committee have ever been sanguine that the claim would ultimately be defeated, this belief did not prevail generally among those having a knowledge of the case, believing that inasmuch as Judge Blatchford had given a decision in the case, adversely to the defence, the court above would sustain his decree. It would seem that now is the proper time to "make up the score" and "honor the brave," for there are some heroes, and many incidents worthy of special mention.

There can be no doubt that the great Cochrane suit—possibly more so than any other—was the means of bringing to the notice of the Supreme Court a realizing sense of the inäquities that were being perpetrated under rules of the patent office and the law as it now stands. The re-issue of that patent and its ratification by the United States Supreme Court, was the work of experts; its subsequent defeat and setting aside of the decision by which it was affirmed, through the masterly and able effort of Mr. Harding, was a measure that benefitted every branch of trade that uses patent improvements of any kind, and no doubt paved the way to a successful defeat of the Denchfield, and many other patent suits.

The Denchfield suit has been a long, tedious and expensive litigation, pressed with great determination from the outset. Every effort possible was made to induce defendants to compromise or settle in order to break the defence, and collect the royalty claimed upon the strength of such settlements, but without avail.

Amid the "suck of barterers for immunity," we are very proud of our genial friend—the defendant in this case—W. G. Gage, of Fulton, N. Y., who has stood all these years as firm as the "granite hills," refusing all inducements to settle or compromise his case or his brother millers, when he might have done so if he would only "sign" *for the full amount of the claim against him.* Yet, with a judgment against him of nearly $4,000, and interest accumulating daily, he never wavered. My pencil cannot do him justice. He is a hero in the broadest sense. We cannot honor such men too highly. Would that all our millers were like him; what an association we could then boast of. Instead of 3,000 capacity, we would have 30,000, a small assessment, and once in five years would be all that would be necessary to replenish the finances.

Much has been said about the facility with which our Rochester friends could turn out Cartier & Robinson models. In this they were no doubt experts, but, nevertheless, we must not forget that we are indebted to that little band of Rochester millers, who steadily and persistantly refused to settle, or compromise their cases although offered a free license if they "would only sign a contract purporting to pay $100 *per run, royalty.* Rather than do this, they contested the demand at a cost of $60 *per run,* before the National Association relieved them of the burden. Verily they are entitled to a public recognition as *honorable and true men.*

To the attorneys in this case we certainly owe much. From first to last they have predicted success at the court of final resort. To Mr. Harding, for his shrewd and masterly generalship in the management of the case, after defeat had placed us at a disadvantage, to his wise counsel and encouragement, together with his strong faith in a successful termination, which was made more forcible by his offer to contest the claim on a contingent fee, thereby strengthening the faith of our committee in his counsel. In the prosecution of this defense, he has been ably assisted by Mr. Gridley, of Chicago, who has had charge of all the suits in Wisconsin, Minnesota and Illinois, and by Mr. Geo. B. Selden, of Rochester, who has really done the *work.* To Mr. Selden's untiring zeal in the working up of details, collecting of evidence—home and foreign—taking testimony, laboring against great odds, meeting defeat without loosing faith, insisting always "that the court of last resort would do his clients justice." His labors untiring, and his faith in final success never wavered.

There are, no doubt, others that have contributed much toward the success of this long and tedious contest. Certainly the rank and file, who furnished the "sinews of war," maintained their faith in the committee—never questioning, but always responding to the numerous calls for money—are equally entitled to credit with those that "buckled on the armor and stood the brunt of battle."

The same messenger that brought the chering news from Mr. Harding also brought from Messrs. Parkinson & Parkinson: "Downton case settled in our favor by Supreme Court." It was no doubt a suprise to many of our members upon learning that the association had taken a hand in the Downton contest, when they already had a contract with Downton which placed a limit to the liability of members in case Mr. Downton sustained his claim in the courts. This was an "option," *and did not prevent our taking up the defense* if circumstances should make it necessary or our interests required it. It is therefore quite proper to give our reasons for entering into a defense under these circumstances. The reasons and facts are many, but a few will suffice at this writing: Mr. Downton, after concluding his arrangement with the association, immediately secured the services of Mr. Harding to prosecute his claim, which was all right and proper, and to which no one took any exceptions, but was considered a wise move on the part of Downton.

Nevertheless, no member of the committee believed Mr. Downton's claim could possibly be sustained, providing *the case was earnestly defended.* The object the committee had in view was to force the manufacturers of rolls *to make this defense,* and relieve the association from such expense. Mr. Downton brought his case against the Yaeger Milling Co., of St. Louis, and was defeated in the United States District Court by the attorney of the Yaeger Milling Co. and F. W. von Cotzhausen, as the attorney of Fr. Wegmann, Zurich, Switzerland. So far, all seemed "fair and square." Mr. Downton then appealed to the United States Supreme Court. The committee had no idea of making any defense until about July last, when it became apparent that there was to be no defense made before the Supreme Court that could be considered sufficient from the association's standpoint. "There seemed to be too many holes in that skimmer."

1. We knew well the wonderful ability and genius of Mr. Harding. He was also reputed to have a large interest in the ownership of the patent.

2. If the Supreme Court *should* declare it valid, there was millions in it for him, which our millers would have to pay.

3. The Yaeger Milling Co.'s attorney was dropped from the case, the company having failed, consequently they *were making no defense.*

4. Mr. Downton had stated "that the contract with the M. N. A. was of *no account,* and would be contested on the ground that the association members, since the contract was entered into, had bought rolls of other parties and not of his company as the contract contemplated, and was therefore not binding."

5. Mr. Downton repeatedly stated to the writer that his relations with Allis & Co. were of a very unfriendly nature; that he expected to see the time when he would "get even with them," and that under no circumstances would he enter into any future business relations with them. Yet we find about this time (July, 1882), Allis & Co. are advertising the "Cranson-Dawson roll," of which Downton claimed *sole ownership,* and Downton in return advertising the "Gray belt drive." This certainly did not look like "war to the knife, and the knife to the hilt."

6. About this time (July, 1882), an interview by telephone with Mr. Allis in regard to this case elicited the reply that "they were not contesting the claim and *had no interest in it.*" Rather a singular stand for the largest manufacturer of rolls in the United States to take, and not in accordance with the idea that "manufacturers of rolls would defend this suit—*for their own protection.*"

7. At a future interview by telephone with Mr. Allis as to who was his patent attorney?" elicited the reply, "Mr. Rainey of St. Louis." Mr. R. was also attorney for Downton, and reputed part owner of the Downton patent, and also that "Mr. Von Cotzhausen was in the employ of Wegmann, and he (Allis) had nothing to do with him."

8. Mr. Cotzhausen, the attorney for Wegmann, and who made an able argument in his (Wegmann's) behalf, in November last, stated that the Wegmann rolls were *grinding rolls,* with *differential speed* and *characteristically different from Downton's* flattening rolls operated at even speed. Consequently *Wegmann's interest is not directly in question,* and this is the only view that could be entertained; consequently we failed to see wherein the interests of the association were securing any defence. Now in view of these facts and many others that appeared as the investigation progressed, it was deemed for the interest of the association to make a defence, and to that end we invited the Jno. T. Noye Mfg. Co., of Buffalo, to join us, which they very cheerfully did, and have shared equally with us in the expence; they are certainly entitled to our consideration.

Messrs. Parkinson & Parkinson, of Cincinnati, were secured to defend in behalf of the association. It was considered advisable not to make the matter public during the contest, as much could be done that otherwise might have been defeated. In getting in their defence Messrs. Parkinson & Parkinson labored under many difficulties, the time allowed them for argument being wholly inadequate to a complete presentation of the case; however, the time at their disposal was used to great advantage.

There are many other "holes in the skimmer" that "need a plug," but time and space forbid. This much is deemed necessary to answer certain criticisms that have appeared, viz., that the association retained Parkinson & Parkinson to represent their interest *and save their members, if possible, the license fee which they had agreed to pay in case the patent was sustained.* Such criticisms are unwarranted, and not sustained by the facts, and eminate with bad grace, from the quarter which they come. As to Mr. Downton's invention, no member of the committee, or any member of the association ever believed it could possibly stand the tests of the court *if properly defended.* Our agreement contemplated a *vigorous defense;* with it falls many other and similar claims, which the patent office has been prolific in granting.

Our "docket" is now clear for the first time in 7 years. What an interesting spectacle, less than 3,000 capacity have been paying out money doing the work and defending the rights of 20,000 capacity, who stand aloof like the Tories of the revolution, enjoying the fruits of other mens toil without due recompense, and yet they no doubt claim to be honest honorable men. Verily, they see through a glass darkly. Yours truly,

S. H. SEAMANS.

Milwaukee, May 14.

GOOD LEGAL NEWS FOR MILLERS.

The "Downton" and "Denchfield" Patents declaired Void.

The millers of the United States will long remember May 7th, 1883, as being an important one to the entire milling industry. On that day the UNITED STATES SUPREME COURT rendered final decisions in what are generally known as the "Downton" and "Denchfield" suits against millers for infringement of their respective patents.

THE DOWNTON SUIT.

This suit technically styled Robert L. Downton vs. The Yaeger Milling Co., came up for trial and decision therein was rendered in the U. S. Circuit Court for the Eastern District of Missouri in September, 1879. The claim in Downton's patent was as follows: *"The herein described process of manufacturing middlings flour by passing the middlings after their discharge from a purifier, through or between rolls and subsequently bolting and grinding the same, for the purpose set forth."*

Judge Treat, after an exhaustive hearing of the cause dismissed the bill, deciding that the patent "was void for want of novelty and uncertainty." Downton in this action demanded $50,000 damages from the Yaeger Milling Co. and a perpetual injunction. From this decision Downton appealed to the Supreme Court of the United States where a final decision was made against him as above stated.

In view of the part in the recent defense made by the Millers' National Association it may be well to briefly review the progress of this case. The contract for building the Yaeger Mills in St. Louis, was awarded to Messrs. Edw. P. Allis & Co., of Milwaukee. At that time Downton was in the employ of Allis & Co., and it is alleged that while in their service he placed the rolls in the Yaeger Mill which formed the basis for the Downton's suit against the Yaeger Milling Co.

Not long before this, Frederick Wegmann, of Zurich, Switzerland, had introduced porcelain roller-mills in this country, and the firm of Allis & Co. were his sole agents. When the Downton case was commenced Mr. Wegmann was of the opinion that if he (Downton) should be successful in sustaining his claims that it would interfere with his (Wegmann's) sale of roller-mills in this country, he therefore employed counsel, Mr. F. W. Cotzhausen, of Milwaukee, to defend the cause. Downton was defeated in St. Louis and took his appeal to the Supreme Court. The original defendant, The Yaeger Milling Co., were in bankruptcy, Wegmann's counsel, Mr. Cotzhausen had come to the conclusion that Downton's claims did not conflict with his clients (Wegmann's), and Messrs. Edw. P. Allis & Co. claimed to have an assignment of his (Downton's) patent from Downton, so that if Downton should win, it would be for the benefit of Allis & Co. and in case he lost, they would suffer no material damage.

The defense stood in this condition in April, 1882, at which time Mr. Seamans, Secretary of the Millers' National Association, reviewed the situation carefully and determined that it was of importance that the suit should be vigorously defended in the interests of the Association. After considerable correspondence, the Executive Committee approved of the Secretary's plans, and he was duly authorized to retain Messrs. Parkinson & Parkinson, of Cincinnati, to defend the interests of the Association and to induce some of the manufacturers of roller-mills to assist in the defense. In August, 1882, the JOHN T. NOYE MANUFACTURING CO., of Buffalo, N. Y., agreed to join in the defense with the Association and to defray half of the expense. It is quite possible that the final result in this suit might have been different had it not been for the watchfulness of the Secretary and the prompt action taken by the Executive Committee, which was certainly of material aid to others engaged in the defense.

THE DENCHFIELD SUIT.

In April, 1858, John Denchfield, of Oswego, received a patent for an alleged improvement in cooling or drying meal in process of manufacture. The invention consisted of a combination of the meal-spout and conveyor-box, a suction fan and suction spout, by means of which air is drawn through the curb, meal-spout and conveyor-box and suction-spout, cooling the stone and meal and carrying off moisture, so that the accumulation of dough is prevented, and also the escape of flour-dust into the mill.

Denchfield's patent having been purchased by a syndicate of speculators, suits were commenced in July, 1874, against Gage & Co. and Nelson & Co., of Fulton, N. Y. Hon. H. R. Silden, of Rochester, N. Y., was employed as counsel to defend the cases. After a lengthy trial, Judge Johnson decided in favor of the patentees, and the damages were fixed by Ward Hunt, Master in Chancery, as being equal in value to one barrel of flour out of every 600 made. An appeal was made to the U. S. Supreme Court, and in the meantime many suits were brought in Wisconsin, Illinois and Minnesota. Efforts were also made to compromise with the Millers' National Association. The Association offered to pay $25 per run, but the proposition was declined by the Denchfield party. The final arguments in the U. S. Supreme Court were made by Counsellor Thurston for the Denchfield party, and by Counsellor Harding for the millers. The decision was in favor of the millers, on the grounds that a re-issue must be for the identical claim for which the original patent was granted, and that a broadening of the claim by dropping out some of the essential elements, invalidates and renders the re-issued patent void.

BOOK NOTICES.

Among the many good things found in HARPER'S MAGAZINE for April may be mentioned the following: Faustus—Frontispiece—From a drawing by E. A. Abbey; Lambeth Palace: "Ye Archbishop's Inne"—Zadel Barnes Gustafson—With ten illustrations; The Folding—A Poem—Annie Fields; The Hundred Years' War—T. W. Higginson—With seven illustrations; A Castle in Spain—A Novel Part II—With four illustrations by Abbey; Indian Art in metal and wood—J. L. Kipling—With fourteen illustrations; On the edge of the marsh—A Poem—Miss A. A. Bassett; The Home of Hiawatha—Ernest Ingersoll—With twelve illustrations; Sunlight mysteries—William C. Wyckoff—With nine illustrations; Rus—A Sketch—Charles Reade; Unuttered—A Poem—John B. Tabb; The Romanoffs—Part I—H. Sutherland Edwards—With thirteen portraits; Death in the Sky—A Poem—George Edgar Montgomery; Faustus—A Poem—S. S. Conant; Carlsbad Waters—Titus Munson Coan, M. D.; The mount of Sorrow—Harriet Prescott Spofford; An Æsthetic Idea—A Story—A Working Girl.

UNITED STATES MILLER.

E. HARRISON CAWKER, EDITOR.

PUBLISHED MONTHLY.

OFFICE, Nos. 116 & 118 GRAND AVENUE, MILWAUKEE, WIS.

SUBSCRIPTION PRICE.—PER YEAR, IN ADVANCE.

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[Entered at the Post Office at Milwaukee, Wis., as second class matter.]

MILWAUKEE, JUNE, 1883.

We respectfully request our readers when they write to persons or firms advertising in this paper, to mention that their advertisement was seen in the UNITED STATES MILLER. *You will thereby oblige not only this paper, but the advertisers.*

Flour Mill Directory.

CAWKER'S AMERICAN FLOUR MILL DIRECTORY shows that there are in the United States 21,356 flour mills and in the Dominion of Canada 1,488. The mills in the United States are distributed as follows:

Alabama, 388; Arizona, 17; Arkansas, 234, California 209; Colorado, 52: Connecticut, 309; Dakota, 44; Delaware, 96; District of Columbia, 7; Florida, 81; Georgia, 514; Idaho, 18; Illinois, 1258; Indiana, 1168; Indian Territory, 3; Iowa, 872; Kansas, 437; Kentucky, 642; Louisiana, 41; Maine, 220; Maryland, 349; Massachusetts, 363; Michigan, 831; Minnesota, 472; Mississippi, 297; Missouri, 942; Montana, 20; Nebraska, 205; Nevada, 10; New Hampshire, 202; New Jersey, 445; New Mexico, 28; New York, 1942; North Carolina, 556; Ohio, 1462; Oregon, 129; Pennsylvania, 2786; Rhode Island, 47; South Carolina, 205; Tennesee, 620; Texas, 548; Utah, 129; Vermont, 231; Virginia, 689; Washington Territory, 45; West Virginia 404; Wisconsin, 780; Wyoming, 3; Total, 21,356.

The directory is printed from new Burgeois type on heavy tinted paper and is substantially bound. It makes a book of 200 large pages. The post offices are alphabetically arranged in each state, territory or province. The name of the mill, the kind of power used and the capacity of barrels of flour per day of 24 hours are given wherever obtained which is in thousands of instances, This work is indispensible to all business men desiring to reach the American Milling Trade.

Price Ten Dollars per copy, on receipt of which it will be sent post paid to any address. Remit by registered letter, post-office money order or draft on Chicago or New York made payable to the order of E. Harrison Cawker, publisher of THE UNITED STATES MILLER, Milwaukee, Wis.

MILLERS' NATIONAL ASSOCIATION.

Secretary's Office, Milwaukee, Wis., May 12th, 1883.

Messrs. The Jno. T. Noye Mfg. Co.,
Buffalo, N. Y.

I am in receipt of your draft on the National Shoe and Leather Bank, New York, for the $.....being one-half of retainer fee and expenses of Parkinson & Parkinson, Cincinnati, O., in case Downton vs. Yaeger Milling Company as agreed. The result of this contest equals our most sanguine expectations, and should be a source of mutual satisfaction. Thanking you for the financial aid so freely extended in behalf of the milling interests.

I remain, yours very truly,
S. H. SEAMANS, Sec'y.

FORTY-EIGHT per cent. of all the cleared land in the Province of Ontario, Canada, is used for raising grain, and 26.3 per cent. is sowed to wheat.

SOME of the leading French millers have at last adopted the roller mill system and have found it profitable. It is said by a French correspondent that there is little doubt but that most of the large French mills will be changed into the roller system within a year.

THE *Roller Mill* has come out with another device for a bran-packer and claims that $1,000 prize—It is no use trying to beat our Minnesota man's device as published in our May number—To him belongs the "cake" and—ergo—he must have it. The *Roller Mill's* device is a clear infringement.

THE Case Manufacturing Co., of Columbus, O., informs us that they have just increased their capital stock and broken ground for two new buildings which will add about 30 per cent. to their present capacity. They report business exceedingly good and add, "we are daily making new entries in our order book, many being for full roller mills on our system from neighborhoods in which we already have our mills running."

THE SPENCERIAN BUSINESS COLLEGE in Milwaukee has during the past year had a very large attendance and the work done has been unusually good. There are no vacations and students are admitted at any time for the business course or for special branches, including short-hand and type writing. The advantages afforded during the summer months, including July and August are excellent.

THE Downton Manufacturing Co., of St. Louis, are doing a good business and selling roller mills all over the country. Now that the legal matters are out of the way they expect to do a larger business than ever.

THE Missouri Millers' Association met in St. Louis May 18, in the words of the Secretary, "to elect officers for the ensuing year and transact such other business as might be brought before the meeting." The business transacted consisted of the election of officers and a royal boat ride with an elaborate lunch.

OFFICIAL report of the *wheat* and corn production of the United States for 1882, furnished by the U. S. Agricultural Department to S. W. Tallmadge, of Milwaukee.

States and Territories.	WHEAT.		CORN.	
	Bushels.	Acres.	Bushels.	Acres
Maine	512,100	43,700	904,400	30,987
N. Hampshire	148,700	11,500	370,700	37,269
Vermont	378,000	21,150	1,930,300	56,916
Massachusetts	20,100	1,180	1,237,200	57,120
Rhode Island	520	.....	277,900	12,100
Connecticut	43,600	2,150	1,155,800	57,577
New York	12,145,200	772,400	21,187,500	769,115
New Jersey	2,098,700	154,000	9,942,800	343,536
Pennsylvania	20,300,700	1,488,700	43,518,800	1,388,245
Delaware	1,200,600	98,800	3,936,600	208,182
Maryland	8,655,600	620,000	17,904,700	691,542
Virginia	8,811,400	918,900	35,904,000	1,881,568
N. Carolina	5,494,800	710,000	34,260,700	2,446,056
S. Carolina	1,729,000	280,000	16,356,200	1,361,266
Georg'a	3,812,900	510,000	36,617,500	2,747,005
Florida	350	80	3,708,900	392,078
Alabama	1,700,800	285,000	31,982,500	2,300,341
Mississippi	250,100	55,000	30,233,600	1,798,944
Louisiana	7,500	2,200	14,686,400	790,336
Texas	4,173,700	460,000	63,416,300	3,280,329
Arkansas	1,566,100	215,000	34,485,900	1,596,672
Tennessee	9,971,200	1,260,000	75,188,600	3 119,371
West Virginia	4,854,300	430.000	14,927,000	588,233
Kentucky	17,250,000	1,287,000	75,500,900	3,1 3,248
Ohio	43,453,600	2,876,000	93,319,200	2,977,680
Michigan	32.315,400	1,985,000	28,581,600	929,760
Indiana	45,461,800	2,763,000	107,484,300	3,438,332
Illinois	52 302,900	2,956,000	182,336,900	7,914,042
Wisconsin	28,145,400	1,610,000	32,201,600	1,117,240
Minnesota	33,030,500	2,547,000	21,127,600	661,050
Iowa	25,487,200	2,485,000	175,487,600	6.777,302
Missouri	27,538,600	2,335,000	170,037,000	5,763,102
Kansas	31,248,000	1,573,000	144,452,600	4,280,430
Nebraska	18,300,000	1,657,000	82,478,200	2,364,120
California	36,046,600	2,767,000	2,790,900	98,634
Oregon	12,689,300	723,000	130,000	5,450
Nevada	95,000	4,520	18,000	880
Colorado	1,598,200	95,000	422,400	21,076
Arizona	220,000	15,500	57,000	2,709
Dakota	11,460,000	720,000	4,650,000	186,247
Idaho	650,000	40,625	45,000	1,580
Montana	685,000	42,812	18,000	492
New Mexico	767,000	63,917	965,000	45,594
Utah	1,250,000	81,500	275,000	13,208
Washington	2,440,000	148,000	62,000	2,646
Wyoming	25,000	1,560	.....	.....
Indian Terr	.....	.....	.....	.....
Total	504,185,470	37,067,194	1,617,025,100	65.659,546

ABOUT THE DOWNTON CASE.

AN INTERESTING LETTER FROM MESSRS. EDW. P. ALLIS & CO.

MILWAUKEE, WIS., May 28, 1883.

Editor United States Miller.

Although the celebrated suit of Downton vs. The Yaeger Milling Co. is now a thing of the past, in view of the general amount of misinformation regarding it, we think it proper to state a few facts in connection with it in order that your readers may be better enabled to give credit for the successful termination of this suit to the parties who have contributed most largely both in work and money to defeat the Downton patent. There have been so many errors and misstatements in the several milling papers both regarding the suit and our relations thereto that we wish to get matters straight so far as lies in our power and without taking any credit to ourselves, to place it where it actually belongs. In order to do this, we will give a little review of the history of this case in its early stages.

Up to the Vienna International Exposition of 1873 roller milling, although in Germany at an early time extensively practiced, was comparatively little known. The first roller mills did not prove adequate to the general demand. The science of roller milling was fairly understood, but the art practically abandoned. In the United States, prior to 1873, no instance can be traced where rolls were ever used on middlings. Since the Vienna Exhibition and the almost simultaneous invention of the Wegmann Porcelain Rolls, roller milling received a new impetus abroad, and rapidly spread to the American continent. To the vigorous agitation by the famous engineer Oscar Oexle, is due to a very great extent the universal adoption of rolls in milling. It was Oexle who at the Millers' Convention at Buffalo, in 1877, first pronounced the Downton roller patent to be an imposition upon the milling public, and who caused to be published under date July 12, 1877, the following letter:

OFFICE OF EDW. P. ALLIS & CO.
MILWAUKEE, WIS., JULY 12, 1877.

Editor American Miller.

In your July number you publish a card from R. L. Downton and Tom Miller, Jr., wherein they assert the exclusive right to "sell and license rolls of any material to be used in crushing middlings," and threaten to prosecute, as infringers, all who use rolls not procured from or through them.

Now, you will oblige us by bringing to the notice of your readers the following facts, so that millers shall not be misled by the above assertion, which, although broadly made, is utterly without foundation.

What is called the Downton Patent No. 162,157, wherein "he claims to have invented a new and useful improvement in the process of manufacturing the middlings flour, by passing the middlings after they are discharged from a purifier through or between rolls," is nothing more or less than borrowed from standard scientific works, published in Europe, and extensively circulated here. The use of rollers in this connection, being known and resorted to abroad as early as 1835, and to the certain knowledge of the undersigned introduced into this country ever since 1873.

No one ever thought it possible that a process so well known and widely spread would be made a subject of patent right, until Mr. Downton filed his application at Washington on March 29, 1875.

By the Wegmann patent, No. 182,250, applied for on this continent May 21, 1875, and dating back in England to 1874, the use of rolls generally is not covered, the improvement claimed being in the unbroken surface of porcelain or other equivalent silicious substance, and certain other mechanical appliances in the machinery.

Ready to substantiate the above statements by the most overwhelming proof, our attorney, Hon. F. W. Cotzhausen, of the firm of Cotzhausen, Sylvester, Schreiber & Smith, at Milwaukee, by our direction, under date of July 5, 1877, addressed a letter to Mr. Rainey, the attorney of Messrs. Downton & Miller, wherein he said: "If Mr. Downton would file a bill against Mr. Wegnann or Oscar Oexle, to test the validity of his certain patent right, we are authorized to enter their appearance, with a view of bringing the matter to an early and final decision; but it must be apparent to you that the continued writing of letters to third parties, interested in the purchase of rolls, and threatening them with litigation, is anything but fair, especially when we tender the opportunity of testing your clients' rights in a suit against the principal and his agents."

Notwithstanding our said offer, no suit of any kind has as yet been commenced against us. Mr. Downton and his associates well know that we are constantly selling the Wegnann patent rollers and infringing upon his pretended patent right. Now, what we desire is an opportunity in court to expose the piracy of those parties, and we therefore call upon our customers who may be molested by threat of suit, in any way or manner, to immediately notify our attorney, F. W. Cotzhausen, so that we may be permitted to assume and conduct the prosecution or defense of the case.

Please insert the above in your esteemed paper and oblige, Yours, etc.,

FR. WEGMANN,
OSCAR OEXLE.

The suit of Downton against the Yaeger Milling Co. was the result of such challenge. Mr. F. W. Cotzhausen, attorney for Wegmann, took charge of said case and was assissted on the hearing by Geo. M. Stewart, of St. Louis, as local counsel and solicitor of record. A great deal of testimony was taken over all parts of the United States, and all expenses were cheerfully defrayed by Mr. Wegmann. No other person ever contributed thereto. The National Millers' Association was tendered by the attorneys for Wegmann the privelege of assisting in the defense, but did not accept thereof; on the contrary, the Executive Committee, pending such litigation, in May, 1879, gave notice that "on behalf of members satisfactory arrangements had been made for license under said patent," and its action in this behalf seriously embarrassed the efforts of Mr. Cotzhausen and client. To relieve the milling public of a monopoly, which at that time was asserted on all rolls which were used for crushing middlings—see Oexle's letter to *American Miller*, July 18, 1879,—the decision at St. Louis in Mr. Wegmann's favor was an unexpected blow to those in sympathy with the patent. It was the result of hard labor and earnest fighting.

Mr. Downton appealed. The Supreme Court in disposing of the case now adopts almost the identical words of Oexle in his letter of July 12, 1877, where he said that, "the Downton pretended process is nothing more or less than borrowed from standard European scientific works; that the use of rollers for this purpose was known and resorted to abroad as early as 1835."

The suit of Downton vs. The Yaeger Milling Co. was brought just at the time Mr. Fr. Wegmann was first introducing his porcelain roller mills into this country. At first, Mr. Wegmann was of the opinion that the Downton patent, if sustained, would materially interfere with the further sale and use of his machine here, and he therefore retained Hon. F. W. Cotzhausen, of this city, as his attorney, and instructed him to undertake the defense of the suit. Further consideration convinced Mr. Wegmann that the Downton patent would not materially interfere with the sale of his machines, as they were not used in the manner or for the purposes specified in the process patent, but having once undertaken the defense and being convinced that it would cost the millers of the United States much money unless carefully defended, and having too much pride in the matter to allow it to go by default, he instructed Mr. Cotzhausen to continue the defense vigorously and prosecute it to a successful termination. The expense incident to the defense has been most largely borne by Mr. Wegmann and the work by Mr. Cotzhausen, and it is but simple justice to these gentlemen that the facts should be explicitly stated.

Without taking in the least from any credit which can justly be claimed by others, it is but simple justice to Messrs. Wegmann and Cotzhausen to state the fact of their unwearying interest in defending the suit and carrying it to the court of last resort and their unstinted expenditure of time and money to secure a decision which should benefit every miller in this country, whether a member of the National Association or not, and to place the right to use either smooth iron or porcelain rolls beyond a question.

The Secretary of the Millers' National Association has seen fit to make public a few of his many "suspicions" regarding the connection with this case and following the precept of the French law which considers every man guilty until he proves himself innocent, he by implication charges collusion between ourselves and Mr. Downton. His three principal counts in the indictment are:

1. Despite many savage remarks by Downton, it was found that Downton was using the belt drive, and that we were prepared to furnish such of our customers as desired them with rolls under the Dawson-Cranson patent,

2. That we were not actively interested in contesting Downton's claims.

3. That Mr. Rainey, at one time Downton's attorney, was our attorney also.

Without noticing the frivolous character of the first and third counts further than to say that we cannot be held responsible for Mr. Downton's loud talking, and that the arrangement regarding the Grays Belt Drive and the Dawson-Cranson rolls could have no direct or indirect connection with Downton's fight with Wegmann; and further that Mr. Rainey was our attorney in certain cases in which neither the millers' association, the millers outside the association, nor Downton himself were interested, we wish to state in answer to the second count, that we were not interested in the defense of the suit and steadily refused all solicitation to become parties thereto, because we were already contesting Mr. Downton's claim to the ownership of the patent and had appealed our suit in order to be in position should the Downton patent be sustained by the supreme court, to reopen the case and introduce new evidence which we had obtained since the first trial. This we could not have done had we become in any manner implicated in the suit between Downton and the Yaeger Milling Co, which suit was being vigorously defended by Mr. Wegmann and his attorney Mr. Cotzhausen. Our only intention was to keep ourselves in shape to protect our customers and if in doing this we protected millers who were not our customers, we could, were we so disposed, claim the same credit that the association does for protecting others than its own members.

Whatever may have been the motives which led the association into joining the defence, we have no disposition to question them or to detract from any credit which may be due to the association or its attorneys. We do not intimate any suspicion because the attorney for the association in one case was the attorney for Downton in another, nor cry out collusion because the association had previously compromised with Mr. Downton on this same patent. We simply desire to give all credit to the persevering efforts of Messrs. Wegmann and Cotzhausen, which have resulted in saving millions to the Millers of the United States.

Yours truly,
EDW. P. ALLIS & CO.

ED. DURANT, formerly of the City Mills, Milwaukee, is now located at Arvilla, Grand Forks Co., Dakota, where he has charge of a 150,000 bushel elevator, etc. A roller mill is to be erected there this summer.

[The following article which was written for *The Miller*, London, by a milling engineer, contains many points of interest and much information of value to young American millers who have a desire to learn. The publisher of the UNITED STATES MILLER has endeavored to obtain an article something similar to this from a well known American milling engineer, but as he has been unable to do so, he believes he renders a valuable service to his readers by republishing from *The Miller*, London, the article as below. The article was prepared with a view to assisting millers to pass the examination for admission to the ranks of English journeyman millers.]

STUDIES FOR YOUNG MILLERS.

Milling Technology, with Suggested Questions for Examination Therein.

6. *Manufacture.*—Mechanical questions in relation to the manufacture of flour should embrace theoretical as well as applied mechanics. The mechanical principles involved in milling processes are generally of a highly complicated nature, and they very rarely admit an application of elementary rules.

The object of all milling processes is either *reduction* or *separation*. The grain is first *separated* from dirt and foreign admixtures, then it is subjected to various *reductions*, and finally the finished products of each reduction are separated from the unfinished products until a more or less perfect separation of the *digestive* parts from the *indigestive* parts has been attained.

The object of the *reduction of grain* is to overcome its internal resistance, and thereby to destroy the connection of its parts. This can be done either by a *tearing*, *crushing*, *cutting*, or *percussive* action.

A *tearing* action is produced in those reduction machines where the grain is brought between a rotating and a fixed body, or between two rotating bodies having differential velocity. The grain is held back by friction, or by the peculiar construction (furrows, flutes) of the working parts of the machine, while either the moving or fixed part draws the grain forward, thereby tearing it asunder, or at least detaching small parts from the same. This tearing action is the characteristic of all millstones, and most disc mills, except those of the latter, which have been specially constructed with polished surfaces and without cutting edges in such a manner that they work moderately percussive, like the Johnathan Mills reduction machines.

A *crushing* action is produced either by two rotating bodies moving with equal velocity (smooth crushing roller heavy cylindrical body rolling over a fixed plane surface.

A *cutting* and *scraping* action occurs in those reduction machines where the two rotating bodies have a certain number of *sharp* continuous cutting edges, and move with differential velocity (fluted rollers). As soon as the edges are made round (non-cutting) the action becomes more bruising and crushing. If one of the sharp fluted surfaces is standing still while the other moves at a certain speed, the action becomes more or less tearing, like that of fluted rollers with fluted grinding blocks, or that of sharp fluted disc mills.

A *percussive* action finally takes place in those reduction machines where the grain is thrown violently against the projections of a fixed disc by means of the projections of a rapidly revolving disc (disintegrators), or where the grain is impelled by means of a rapidly moving stream of air and is thus thrown against a fixed disc (Chichester's pneumatic reduction machine).

The *separating processes* employed in the manufacture of flour may be divided in two classes. In the one class the reduced material is separated accord.... ressing process), and in the other it is separated according to gravity (purifying process).

The mechanical principles relating to these various processes are mostly complicated, and it is therefore evident that only a thorough knowledge of both *applied* and *theoretical* mechanics can give the milling student a perfect idea of the most advantageous mode of operation.

Millers intending to study applied mechanics for the coming milling examinations should first read descriptions of steam and water motors and of milling machines, and they should take special notice of the details of such machinery. Next they should familiarize themselves with the mechanical principles of simple machines like levers, pulleys, and that of the inclined plane. Also screws, the principle of wheel and axle, means for converting motion, like endless bands, toothed wheels, rack and pinion, the crank and connecting rod, &c. They should also study the definitions of energy, work, *vis viva*, &c.; the principles of hydraulics, friction, and the strength of materials. They should, finally, specially notice the mechanical principles of water wheels, turbines, windmills, and steam engines, &c.

7. *Motors.*—The principal sources of energy employed for driving mills are the expansive force of steam, the energy exerted by falling water, or by the *vis viva* of the same, also of air in motion, and finally, muscular energy.

a. The primary source of energy actuating a steam engine is *heat*. The non-expansive water in the steam boiler is converted into steam, that is, an *expansive* fluid, by the heat which is emitted by the burning fuel in the boiler furnace.

When this expansive fluid—the steam—has attained a certain degree of tension, higher than that of the surrounding atmosphere, it is admitted into a suitable cylinder, fitted with a movable piston, in such a manner that the space on one side of the piston is in connection with the boiler, whereas the space on the other side of the piston is in connection with the atmosphere.

The steam, therefore, exerting a greater pressure against the piston than the atmosphere, will be able to overcome the resistance of the latter, and thus move the piston forward. As soon as the piston has thus been moved through a certain distance, the connection between the boiler and cylinder is cut off, and the piston will then be moved by the expansive force of the volume of steam enclosed in the cylinder.

When the piston has arrived at the other side of the cylinder the boiler steam is admitted to that side, whereas the steam which has already expanded, and thereby performed work, is allowed to escape, so that now the piston will be pushed back to its first position. Thus a reciprocating motion is produced, which is in most cases converted into a rotating motion by means of a connecting rod and crank.

In condensing engines, the escaping steam is brought in connection with a vessel in which a low tension and low temperature are kept up. Thereby the tension of the exhaust steam is quickly reduced below that of the outer atmosphere, and thus a greater ratio of expansion can be attained.

b. The purpose of a fly-wheel in connection with a steam engine is to equalize the variations of velocity caused by the crank motion.

The pressure exerted by the steam against the piston is not fully transmitted to the crank pin in all positions of the latter. When crank and connecting rod stand in a straight line, there is no tendency to turn the crank round its centre, whereas the whole piston pressure is transmitted when crank and connecting rod are at right angles. If therefore a uniform resistance has to be overcome by the steam motor, it is necessary that the piston pressure should exceed the resistance of the driven machinery when the crank is at right angles with the connecting rod. This would cause a periodical variation of speed, and the fly-wheel is intended to minimise these variations. Its heavy rotating mass has a certain moment of inertia, that is, a tendency to maintain its velocity. When, therefore, the amount of force working on the crank is in excess of the resistance of the driven machinery (when rod and crank are at right angles), it will prevent a sudden increase of velocity. t will stor e up a certain amount of energy, which will become available when the force working at the crank is less than the resistance (when the crank passes over its dead points).

c. The cost of a steam motor per 280-stone sack of flour depends entirely on local circumstances. It depends, firstly, on the amount of power expended in the production of a sack of flour, that is, on its mode of manufacture; and it depends, secondly, on the cost of this necessary amount of power, that is, on the cost of fuel burned per horse power.

The average consumption of coal of first-class steam engines may be taken at 2 lbs. per hour per indicated horse power.

Supposing a mill with six pair of stones, two pair of porcelain roller mills, and the necessary dressing, purifying, and wheat cleaning machinery, to require a steam motor of 100 indicated horse power to drive it, then the average consumption of fuel in this mill would be 200 lbs. of coal per hour.

Such mill working day and night will turn out about 400 sacks of flour per week of, say, 130 hours, so that 200 x 130=26,000 lbs. of coal would be required to manufacture 400 sacks of flour. The cost of this quantity of coal may be taken at, say, £12, and for cost of attending engine and boiler, cost of oil, &c., another £3 per week may be added; so that, in this case, the manufacture of 400 sacks of flour would cause an expenditure of £15 for the steam motor.

Therefore the cost of the steam motor per 20-stone (280 pounds) sack of flour may be taken at 9d. per sack, if an improved low grinding system is used.

In this case it is supposed that about 55 per cent. of flour is obtained in the first run, leaving about 30 per cent. of middlings and about 12 per cent. of bran, which is finished in a bran duster. The middlings are purified, ground over one pair of middlings stones, then dressed through a centrifugal, and the tailings of the latter are passed over one of the porcelain roller mills, whereas the other porcelain roller mill treats the second quality of middlings coming from the purifier. The products from the two porcelain roller mills are dressed through a second centrifugal, and the whole flour is mixed into one straight grade. Four pair of stones are supposed to work on wheat, one on middlings and one pair is sharpening (being dressed). The first run is supposed to be dressed through two long silk reels.

Of course, not every steam motor has so low a consumption of coal as 2 lbs. per hour per horse power; it often amounts to 3, 4, and 5 lbs. per hour. In that case, of course, the cost of steam power per sack is much greater than 9d. per sack.

A greater number of breaks does not necessarily increase the cost of steam power per sack of flour. Although more machines may be employed, each of them may require less horse power; so that the total amount of power required for manufacturing an equal amount of flour may not be greater in the case of gradual reduction.

As, however, the cost of maintenance may be slightly greater in the latter case on account of a greater number of more elaborate machines, the cost of manufacturing a sack of flour may be a little greater when gradual reduction is employed, taking into account the total expenses of the mill and interest on the capital employed.

d. The immediate source of energy utilized in water motors is the gravity of the water molecules, that is, the force with which these water molecules are attracted towards the centre of the earth.

The water on entering the hydraulic motor may already possess a certain amount of *vis viva*, that is, it may already have attained a certain velocity so as to exert a certain energy by its impact, or it may act through its gravity only, or work may be performed both through the impact and gravity of the water.

e. Overshot and breast wheels are mainly actuated by the gravity of the water, whereas undershot and turbine wheels are impelled chiefly by impact.

f. Water motors are generally a much cheaper source of energy than steam motors, but they are not so reliable and constant as the latter. The very irregular supply of water sometimes causes stoppages of the mill, and often a reserved steam engine has to be provided in order to assist the water motor when the quantity of water decreases during the summer months.

In mills a very uniform velocity of the machinery is required, and therefore an easy regulation of the amount of power exerted by its motor must be possible, so as to allow for putting in work or disengaging different milling machines at certain times.

Water motors actuated mainly by gravity are less liable to variations of speed than those actuated by impact like undershot and turbine wheels. But the first have only a slow motion; they, therefore, require a great amount of powerful gearing in order to get up a suitable speed of the shafting, whereas the latter have a greater velocity, and they allow, therefore, simpler means for transmission of power.

Wind motors were formerly very extensively used for milling purposes, but they are now gradually disappearing. They are too irregular and unreliable, although they utilize a very cheap motive power. It is not advantageous to expend a large amount of capital for a mill which often is unable to work at the very time when there are favorable opportunities for doing profitable business.

Animal motors are too dear. They are only suitable for driving very small mills in out of the way localities.

8. *Machinery.*—The transmission machinery of mills is practically the same as that of other factories. Some special movements have found an application in certain milling machines, but as they are generally characteristic features of the respective milling machines they need not here be specially noticed.

Information on the elements of transmission machinery can be easily obtained from the many text-books on "Machinery and Mill-work," like those of Rankine, Fairbairn and others, which will enable the milling student to gain a clear insight into the principles of the transmission of power. This information will also greatly assist students in the Science and Art Department's Examination on "Machine Construction and Drawing."

9. *Technology.*—The sources of information on milling technology are scarce, at least so far as modern milling is concerned. Much useful material can be found in the milling press.

A rational way of studying milling technology would be to follow the three leading divisions, "*preparation*, *reduction* and *separation*."

First, all available information relating to "*preparation*" should be carefully looked up and studied in such a manner as to take special notice of the principles on which the various preparatory processes are based. In the same manner also, "*reduction*" and "*separation*" may be studied in succession, with special regard to the characteristic features of the various operations.

10. In preparing wheat for grinding, all those admixtures or parts of the grain which would have an injurious effect on the quality or color of the flour are sought to be removed.

The separation of foreign admixtures from wheat is based either on differences of *size*, of *gravity* (heaviness), or of *shape*. The separation of dust, earth, straws, sticks, lumps, stones (either smaller or larger than wheat), small seeds, etc., is based on differences of *size*. The means employed for this purpose are therefore either rotating or vibrating sieves of different fineness.

The separation of chaff, dead grains, and that of lighter or heavier admixtures of about the same size as the wheat, is based on *gravity*. In machines employed for this purpose (aspirators, separators, etc.), the grain is generally made to fall through a certain space, where it is exposed to the influence of moving air. Thereby the lighter parts are diverted further off their perpendicular line of fall than the heavier ones, and the different qualities are separated and collected by means of inclined surfaces.

Stones of about the same size as wheat are separated by passing the grain over a slightly inclined vibrating box of triangular shape, in such a manner that the wheat will pass out at the upper end (the base of the triangle), whereas the stones will move towards the lower part of the box (the point of the triangle), where they are periodically removed.

The separation of such admixtures as cockle seeds, oats, etc., (which have passed through the same meshes with the wheat, and which have nearly equal gravity), is based on the peculiar shape of these admixtures. Cockle seeds are round, and oats are longer than wheat grains. If therefore the grain is passed through a slowly revolving cylinder, the inner surface of which is indented with suitable cavities, the longer grains will slip out of these cavities sooner than the shorter or round grains, which will be lifted to a higher point. Thus these latter may be caught by an inclined surface as they fall out of the cavities, and can be collected in a separate receptacle.

These three preparatory processes may be done in separate machines, or two or three of them may be combined in one machine.

The separation of those iron particles which have passed with the wheat through the same sieves is easily accomplished by means of the attractive force of strong magnets, which will hold them back, and thus allow their removal either periodically by hand or continuously by an automatic arrangement.

Finally, the removal of the beard and all those impurities which *adhere* to the outer coating of the wheat, is affected by means of friction (smutters, brushes and ending stones).

Wheat may also be cleaned by a washing process, and even a separation of chaff, and of stone, sand, etc., may be achieved by washing, but a costly drying apparatus is generally necessary for this wet process.

Wheat is *sized* in order to adapt the working distance of the several first-reduction machines as much as possible to the various sizes of the grain.

a. The object sought to be attained in the preparation of wheat is the removal of all those admixtures and parts of the grain which would have an injurious effect upon the color and quality of the flour, as far as this can be attained without exposing the inner white part of the wheat-berry.

b. The characteristic effect of unremoved smut balls, garlic seeds, cockle seeds, and sprouted grains on the resulting flour, is discoloration of the flour and subsequent injury to its baking quality, by causing chemical changes in the condition of its gluten and starch.

c. The consequences of milling damp wheat are difficulties in dressing the meal, and that the flour resulting from damp wheat does not keep well, because it easily turns sour or becomes musty.

d. The advantages said to be gained by those who advocate heating the wheat previous to reduction are, that the moisture which is contained in the wheat is partly evaporated. The inner flour body of the wheat-berry therefore becomes more dry and friable, it will dress easier when reduced to meal, and keep better. Some advocates say that also the bran is toughened through heating, because the moisture rising from the inner parts will be absorbed by the outer bran coating. Therefore the bran is said to be less liable to pulverization during the succeeding reductions.

e. Lighter grains and similar substances rise to the surface upon a general agitation of a mixed bulk, because the attraction of the earth exerts a comparatively greater force on heavier substances than on lighter ones, or, in other words, they rise because their specific gravity is less. The general agitation gives the heavier grains an opportunity to assume a position nearer the centre of the earth, thereby causing the lighter grains to rise to the surface (float) in the same manner as wood would float on water, because its density (specific gravity) is less than that of the water.

f. The objections to washing wheat are its injurious effect upon the keeping and baking quality of the flour. If the grain is to be properly dried after washing and before grinding, a complicated drying apparatus becomes necessary, and the consumption of a certain amount of fuel increases the cost of production. If the wheat is not thoroughly dried, the same disadvantages in dressing the meal, etc., take place as those mentioned under *c.*

11. *Reduction.*—As mentioned under the subject of *manufacture*, the object of reduction of grain is to overcome its internal resistance, and thereby to destroy the connection of its parts. With reference to the nutritious qualities of the different parts of the grain, however, there are two distinct stages in the reduction process.

In the first stage, the chief aim of the miller is to destroy the connection between the indigestive parts (husk,) and the digestive parts (the flour-kernel,) so as to enable their subsequent separation.

In the second stage, the separated *digestive* parts are reduced to such a condition as to make them suitable for baking or cooking purposes.

The internal resistance of the digestive parts of the grain is much less than that of the indigestive parts; it is therefore possible to treat the grain in such a manner that the digestive parts are subdivided, whereas the stronger indigestive parts remain more or less intact. Thus the latter maintain a larger size, and their original flat shape; whereas the former are reduced to a smaller size, and a more granular shape. These differences of size and shape facilitate their subsequent separation.

The efficiency of reduction machines therefore depends on the proper action of their working surfaces in this respect, that is, whether these latter have such a shape and such a relative motion that they will cause the digestive parts to assume a form which is sufficiently different from that of the indigestive parts to enable their separation.

As stated under the subject of *manufacture*, the action of the working surfaces may either be *tearing, crushing, cutting* or *percussive*.

Each of these actions has a peculiar effect on the ultimate form of the various parts of the grain, and on their more or less perfect separation into digestive and indigestive products.

a. The principal problem of grinding or reduction in milling consists in the perfect severance of the pure digestive parts from the indigestive and deteriorative parts, in such a manner that the latter can be easily separated.

b. The mechanical action of millstones on wheat during its reduction may be described as a "tearing" or "rasping" action.

As the wheat falls into the eye of the stone it enters into the furrows of the runner stone, and these furrows will draw the wheat forward over the undulating rough surface of the fixed bottom stone.

Each time the wheat grains, or their broken parts, are passed over the high points of the bottom stone (the lands,) it will be pressed firm between the working surfaces.

The fixed surface has a tendency to hold the parts back, while the moving surface will press it forward, and thus some particles will be torn off until the fixed surface loses its hold, when the runner stone will draw the reduced part forward to a *narrower* place, where a further reduction takes place in the same manner as before.

Thus, near the eye of the stone, where the surfaces are wider apart (bosom), the wheat will be broken up into several parts, and as these parts are drawn towards the skirt the white flour-kernel will be gradually rasped off the husk, because the resistance of the latter against such a tearing action is *greater* than that of the softer flour-kernel.

c. Heat is developed in millstones, because the mechanical work which is exerted by them in overcoming the internal resistance of the wheat, is converted into heat. A certain amount of heat is also produced by the friction of the wheat on its broken parts with the working surfaces, or by the friction of the broken parts with each other, and in a very slight degree by the friction of the air with the working surfaces and the wheat.

d. A millstone is in "standing balance" when its working surface assumes a perfectly horizontal position, while the stone is "standing." If it assumes this position while "running" the stone is said to be in "running balance."

e. Any weight which is embedded in a balanced millstone, and which can be adjusted in a vertical direction (parallel to the rotating axis) will affect the "running balance" of the stone, but not its "standing balance." The latter is affected by weights which are adjustable in a horizontal direction.

f. The effect of a displacement of a running stone in running balance, when its point of suspension is at its centre of gravity, is that it will be able to change its horizontal position, without losing its *indifferent equilibrium*. The runner-stone will have a tendency to assume a swinging motion.

If its point of suspension is *above* its centre of gravity, the face of the running-stone will have a strong tendency to regain its horizontal position, after a displacement has occured, in order to regain its *stable equilibrium*.

If the point of suspension is *below* the centre of gravity, a displacement will cause the running-stone to lose its *unstable equilibrium*, the face of the stone will assume an *inclined position*, and the latter will have no tendency to regain its balance.

g. The effect of *more* draft in the furrows is that the feed will pass *quicker* over the grinding surface. The *less* draft there is in the furrows, the *longer* will the feed remain between the grinding surfaces.

h. The forces acting on a particle of feed during its process through the stones are—

1. The force with which the top runner endeavors to move the feed particle over the bed-stone in a direction perpendicular to the furrows of the top-stone.

2. The force with which the fixed bed-stone endeavors to resist this movement in a direction perpendicular to its own furrows.

3. The resultant of these two forces, which endeavors to draw the feed particle towards the circumference of the stones.

In the case of bottom runners there is besides a certain centrifugal force which tends to draw the feed particle towards the skirt, and in both cases the air, which is impelled by the centrifugal force of the running stone towards the skirt, has an accelerating effect on the forward movement of the feed.

i. The principal difference between the mechanical action of smooth rollers and millstones is that the first has a crushing effect and the latter a tearing effect. The *relative* speed of smooth rollers is very small, and their surfaces do not have a rasping effect on the feed. The *relative* speed of stones is great, their surfaces are rough, and they cannot avoid reducing the husk to some extent. The contact of the feed with rolls is of very short duration, whereas the contact of the feed with the stone surfaces lasts much longer.

j. The greater the natural roughness of rollers and the greater their *relative* speed (maximum when one roll is fixed, minimum when both rolls have same speed,) the more does their action upon the feed approximate to that of millstones.

k. The advantages claimed for porcelain rollers are their fine natural sharpness, their porosity, their non-liability to rust. But they do not have so great a resistance against wear as have the chilled iron rollers, which are most durable. It is claimed for the latter that when they have been for some time in use, their surface requires a certain natural dullness, which enables them to act as well as the porcelain rollers. For some purposes, the treatment of husky middlings chilled iron rollers are preferable.

l. The advantages claimed for rollers are —1st, that they do not pulverize the bran, and 2nd, that they enable a removal of the crease, dirt, and the germ, without deteriorating the bulk of the flour; 3rd, they therefore produce a purer, more digestive, and stronger flour than stones.

The advantages claimed for stones are—1st, that the will finish the reduction in one operation; 2nd, that they do not compress the feed, and therefore produce a lively granular flour; 3rd, that stones are simpler machines than roller mills, and require less attention than the latter.

12. *Separation.*—Separation is one of the most delicate and most important processes in milling. The differences of size and density of the products of the various reductions are never so distinct that a *perfect* separation of the digestive from the indigestive portions can be achieved.

Although dressing machines separate chiefly according to *size*, their results are also influenced by *density*, because the lighter particles have the tendency to float, and they are thus, in some cases, carried over meshes which are large enough to admit their passage.

Purifiers also, although separating mainly according to density, are greatly assisted by sieves, in so far as thereby the influence of air in motion, which has either a deviating or floating tendency, may be adjusted according to each size.

Up to the present *air in motion* is used in *all* purifiers, but it may be possible to dispence with it; indeed, it would be advantageous to separate the heavier digestive parts from the lighter indigestive parts, without subjecting them to the influence of air in motion, which causes the loss of many nutritious flour particles.

a. As the meal comes from stones or rollers it is desirable to separate it into there different products, namely—(1) *the finished digestive products;* (2) *the finished indigestible products;* and (3) *the unfinished products.* Thus the meal from stones is divided into (1) flour, (2) bran, and (3) middlings. The latter, being an unfinished product, have generally to undergo a further separation, according to size and density, before they are subjected to a further reduction. The meal from rollers does not in all cases contain the indigestive products in their finished state. The desirable object of separation in their case is only two-fold, namely, the separation of the finished product (flour) from the unfinished products. Generally, these latter products are graded according to size in the same machine which effects the separation of the flour. Thus the meal coming from *break rollers* is divided into flour, one or more grades of middlings, and the larger broken particles of the wheat (generally called "breaks" or "granulations.")

b. Separation in modern processes differs from the simple operation following low grinding chiefly in respect of the unfinished products. Very few, if any, unfinished products are produced by low grinding, whereas in modern processes the many unfinished products require a very careful and elaborate treatment.

In low grinding the separation of the indigestive from the digestive products is based nearly exclusively on *differences of size.*

In modern processes the separation of these two products is based *also on density.*

c. The principle of action of middlings purifiers is based on the different density of equal-sized middlings. In some purifiers the middlings are passed over a vibrating sieve of various degrees of fineness. Air in motion is caused to pass through this vibratory sieve and through the agitated middlings, so that the lighter husky middlings will rise to the top, whereas the heavier whiter middlings will fall through the sieve as soon as the meshes become large enough to allow their passage. The *agitation in bulk* which occurs on vibratory sieves greatly assists in causing the lighter husky middlings to float, as explained in answer to question *c* under the subject of *preparation*. In other purifiers the middlings are first sized by means of sieves (either rotary or flat vibratory) into various grades, and each of these grades is caused to fall through a stream of air in motion in such a manner that the lighter husky particles will be diverted further from their perpendicular line of fall than the heavier whiter middlings. By means of numerous inclined planes the different qualities are divided and collected into different receptacles. In a third kind of purifier the middlings are fed on a quick revolving plane surface, so that they are subjected to centrifugal force. The heavier middlings are thus thrown out further than the lighter husky ones, and they thus fall into separate receptacles. A stream of air passing through the falling middlings tends to draw the lighter middlings still further towards the centre line of the rotary disc.

d. Separation, based on size, can take place under the following mechanical conditions:—1. When the unsized product (wheat, meal, middlings, &c.,) is made to pass over *inclined rotary* sieves, so that the influence of gravity will cause the grains, &c., to roll in the sieve towards its lowest point until they can pass through proper, meshes. 2. If the product is passed over *inclined flat* vibratory sieves; or, 3, if the products are conveyed over *horizontal* sieves in such a manner that they are at the same time agitated. Either the *sieve* or the *product* must be set in motion, or *both* may be set in motion at the same time as in centrifugal sifters.

13. *Chemical Composition and Physical Properties of the Wheat Berry.*—Milling chemistry has to answer four main questions:—1. Which are the characteristics of the different chemical constituents of cereals? 2. Which are their quantities? 3. What is their nutritive value? And, 4. In what condition are the digestive parts of cereals most easily assimilated?

The *results* of chemical investigations relating to these four questions, after the have been substantiated by scientific authorities, must be carefully studied by millers in order to enable them to impart to their manufactured products the highest possible value. At the same time, the study of the physical properties of cereals is of the highest importance to millers, in order to find out the best treatment which will cause the various parts of cereals to assume such differences of form that a perfect separation of the indigestive from the digestive parts can be easily accomplished.

a. The wheat berry consists of three main parts—1, the inner white flour kernel; 2, the germ; 3, its hull or husk. The flour kernel or "endosperm" consists of a great number of polygonal cells which are filled with starch-grains and gluten. The central cells contain less gluten than its outer cells. It is enclosed by the so-called embryous membrane, which consists of a single layer of irregular cubic cells. The skin of these cells is much thicker than that of the flour cells. The exact nature of the contents of these cells has not yet been finally ascertained, but it is known that they are mostly albuminoids, although it is uncertain whether they are digestive. The next following membranes, which combined form the tough brown husk of the wheat berry, are the "testa" or, "episperm," the "endocarp," the "epicarp," and lastly, the "epidermis." The latter consists of longitudinal cells, whereas the cells of the endocarp are arranged crosswise. The five membranes of the wheat berry enter its centre in the crease and these divide it in two lobes. The epidermis carries at the pointed end of the berry a number of hairs—the so-called beard. At the other end of the berry, opposite the crease, is situated the germ, a small, yellow oleaginous body, which contains the elements of the future wheat plant. The germ is enclosed by the four outer membranes, surrounded by the embryous membrane, and is separated from the endosperm by a separate cellular tissue.

b. The flour kernel or endosperm is the only portion of the wheat berry which it is desirable to retain in the best flour. The embryous membrane, as well as the germ, may have a certain nutritive value, but their strong fermentative tendency would deteriorate the nutritive value and the color of the flour if they were retained.

c. The organic chemical compounds to which the different structural portions of the wheat berry owe their properties, are starch, gluten, and other albuminoids, water, cellulose, fatty matters, salts, &c.

d. The *endosperm* consists chiefly of starch, gluten, and water. The *germ* consists of starch, albuminoids, fatty matters and water. It also contains minute quantities of sulphur and phosphorus.

The *embryous membrane* consist chiefly of cellular tissue and albuminoids. Its most remarkable albuminous constituent is *cerealine*, a very active ferment.

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BECAUSE, ***By its Unprecedented and General Adoption by the Progressive Millers of this and other Countries,***

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Greater Capacity, Perfection, Simplicity and Solidity of Construction; and the Flour Produced by it Finer in Quality, Purer in Color, Stronger, and holding from

25 to 40 Per Cent. More Gluten.

We undertake the complete building of Mills of any desired capacity.

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Correspondence Solicited. Those about to purchase Roller Mills should send for our recently issued catalogue.

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The *outer coating* of the wheat berry chiefly consists of cellular tissue, containing several mineral constituents, like lime, magnesia, kali, (potassium) natron, (sodium) phosphoric acid, &c. All parts of the wheat berry contain water.

e. The outer coating having a *strong fibrous structure*, and being comparatively tough, it is not so easily reduced as the more *granular, soft* kernel. It is therefore possible to subject the wheat berry to a treatment which will reduce the endosperm to a granular powder, while its outer coating still remains more or less intact, and maintains such a shape and size that it can be separated by means of sieves or air in motion.

The oleaginous germ being very tough yielding it can be flattened out into cake-form between smooth rollers without falling into pieces, whereas the granular endosperm being subjected to the same crushing pressure will be pulverized, and thus the flattened germ may be separated from the pulverized endosperm.

The outer coating is moreover specifically lighter than the endosperm. If, therefore, the reduced particles of both are mixed up, but of the same size, they may nevertheless be separated by the influence of air in motion.

f. Hard wheats contain comparatively more gluten, less water, and less starch than soft wheats. This difference is chiefly due to influences of climate and soil, but also to the influence of manure.

g. Sprouting alters the chemical composition of wheat by causing a gradual liquefication of the endosperm, and its absorption by the growing wheat plant. During this liquefication the gluten is dissolved, and the starch converted into dextrin and sugar.

h. Those who advocate the use of whole meal bread contend that the embryous membrane is of too great nutritive value to be separated from the flour with the bran. They believe that the bran is rich in nitrogenous and mineral, that is, muscle and bone-forming substances, and that it should, therefore, as far as possible, be retained in our staff of life.

Those who oppose the use of whole-meal bread contend that the digestive organs of the human body are unsuitable for digesting the nitrogenous and mineral substances contained in the bran. They hold it to be more advantageous to convert the bran first into beef, mutton, pork, etc., by feeding the respective domestic animals with a food which is much better digested by their far stronger digestive organs, than to overload the human stomach with a food from which it cannot derive an adequate benefit.

14. *Explosions.*—The subject of explosions in flour mills is daily becoming of greater consequence to millers.

The introduction of a great number of modern machines which is now taking place in mills all over the world, has undoubtedly (however necessary they may be for the production of a better flour) the tendency to increase the liability of modern mills to explosion. It is very often contended that *iron* roller mills are far less liable to cause an explosion than millstones. This may be true so far as the individual risk of both machines are concerned, but if the whole outfit of a modern gradual reduction mill is compared with that of an ordinary low-grinding mill, there can be scarcely any doubt that the first is more liable to explosion than the latter.

Very few mill explosions have been originated through sparks issuing from the stones by the accidental passage of flints with the wheat. Inumerable flints and other spark-producing materials pass daily through millstones in those mills where much *foreign wheats* are ground. There are very many London mills grinding large quantities of Bombay and other similar wheats. In scarcely any of these mills are special precautions taken to effect a perfect separation of those stones which are of the same size as the wheat. It is therefore certain that in these mills many flints pass through the stones, and that most probably sparks do arise; but, nevertheless, one never hears of an explosion having occured in these mills *while the feed is on.*

And this is easily explained from the fact that flour *per se* is not explosive; it requires to be *diffused* in *dry air* in the form of *flour dust*, in order to make an explosion possible. Explosion is nothing but a *sudden combustion.* and such a sudden combustion cannot take place unless each inflammable dust or flour particle is surrounded with a sufficient amount of dry air to secure its quick combustion. Each dust or flour particle must besides be sufficiently near the other particles to cause them to *ignite* each other. A thorough diffusion of the dust *in a certain proportion* in dry atmospheric air is the condition which makes mill explosions possible. In the same manner it is a well-known fact that gas is not *in itself* explosive; it requires to be thoroughly mixed, *in a certain proportion*, with air, in order to become explosive. If too much air is in the mixture, or too much gas, no general explosion would occur. Atmospheric moisture affects the thoroughness of the diffusion, in so far as it causes the dust particles to become heavier and to settle, so that they will not float in the air. This is the reason why explosions are less violent, if they do occur, during wet weather.

Therefore, even if a spark does occur between stones while the feed is on, this does not generally cause an explosion. There may be a small amount of diffused flour dust at the very place where the spark arises, and a few dust particles may ignite, but as they are surrounded by the steam arising from the meal, and as they lack a sufficient quantity of air to continue their combustion, they are immediately extinguished without taking effect. If, however, the stones should run empty, it might occur that air containing *diffused* flour dust passes through the stones, and if at that moment a spark should ignite the mixture an explosion might occur, and might be communicated to the stive room. Such explosions are, however, of rare occurence, probably because as soon as the feed ceases, the air passing through the stones does not contain sufficient diffused flour dust to make it explosive. Most mill explosions are caused by partial explosions of diffused mill dust in any part of the mill. It may be smut dust in the wheat cleaning department, or stive in the stive room, or flour dust in another part of the mill. One partial explosion will at once cause a violent shock throughout the mill, much more dust will be caused to fall from the beams, or from the cealings of the mill, and a second explosion will take place, because a fresh diffusion of inflammable material has been prepared, which may be ignited by the first explosion, or by an open light burning in that part of the mill. This is most conclusively proved by the successive explosion of the large mills in Minneapolis, in May, 1878, where the explosion of one mill caused an immediate explosion in another mill which was many yards distant. It is improbable that the flame was carried through this distance; it is far more likely that the violent concussion of the air by the first explosion, caused in the neighbouring mill a diffusion of flour dust, which was subsequently ignited by the burning lights of the mill. The explosion risk of a mill does not, therefore, depend so much on the occurrence of sparks, as in stone mills it is influenced *in a far greater degree* by its greater or smaller tendency to create diffused flour dust; and this is the reason why, I believe, that at present many roller mills are more liable to explode than stone mills. The far greater number of quick-moving machines, such as centrifugals, purifiers, and roller mills, must each of them cause a corresponding diffusion of flour dust, which will lodge on the top of the machines, on the beams, and in the crevices of the walls, and they are, therefore, undoubtedly a greater source of danger than the few slow-moving reels in low-grinding mills. I do not say this because I depreciate gradual reduction, on the contrary, I am convinced of its superiority, but I am, nevertheless, obliged to admit their greater risk. No doubt there are means to reduce, to a great extent, the diffusion of flour dust in modern mills, and millers who are alive to the advantages of gradual reduction will not forget to adopt such precautions as the employment of *efficient dust-catchers*, the strict exclusion of *open lights* in the mill, *smooth walls* and *smooth ceilings*, which do not allow an accumulation of dust.

There is one other point of great importance with regard to mill explosions, that is, the influence of the moisture of the atmosphere on diffused flour dust. Professor Tobin, in an address delivered to the "Fire Underwriters of the North-West of America," has very clearly explained the great influence of the atmospheric moisture on the combustability of flour dust. He had carefully noted the percentage of humidity in various parts of a Kentucky mill, and he observed that whereas the moisture of the grinding and bolting flour was much greater than that of the outer atmosphere, that of the stive room was much less. He also showed that whereas in a dry atmosphere a violent explosion of flour dust would take place, if sufficient moisture was contained in the air, that the combustion of the flour dust would be greatly retarded thereby. He therefore recommended the periodical charging of dust rooms with vapor or steam, and the use of hygrometers in mills, so as to have a full knowledge of the state of their atmosphere; and, indeed, it is very advisable for millers to keep their stive rooms and smut rooms sufficiently moist by artificial means, and thereby to reduce, if not to exclude, all risks of explosions. Such moisture would not affect the value of the stive or the smut dust, nor would it influence the efficiency of the wheat cleaning department, or the quality of the resulting flour.

a. The inflammability of the flour dust is due to the presence of carbon and hydrogen in the same. Both are burned during combustion with the aid of oxygen derived from the surrounding atmospheric air.

b. During combustion the carbon combines with the oxygen, and is converted into carbonic acid gas; whereas the hydrogen combines with the oxygen, and is converted into water in the form of steam.

c. The combustion of flour dust causes an explosion because the burnt dust particles are suddenly converted into gas under a great evolution of heat, so that they, and the air which allowed their sudden combustion, expand considerably, and require a far greater amount of space, under the same pressure, than they occupied before.

d. The measure of intensity of a flour dust explosion under the most favorably conditions depends on the *proportion* between the amount of space required by the diffused flour dust *before* the explosion, and the amount of space required by the products *after* the explosion under the same pressure. The intensity of the explosion is measured by *the time* during which the sudden expansion of the explosive mixture takes place. This time is greatly influenced by the percentage of moisture contained in the explosive mixture. The less moisture the more violent the explosion.

e. Explosions are more frequent now than formerly, because modern mills contain a far greater number of quick-moving machines than the old mills, while each of them causes a corresponding diffusion of flour dust, and thus tend to produce an explosive mixture of the inflammable dust with the necessary atmospheric air.

(*To be continued.*)

TARIFF LOGIC.

Samuel Peebles is a farmer in Iowa who thinks as he sows, and reads when he rests. In his ruminations upon the tariff question he has settled down to the following conclusions:

A tariff for revenue only, if it means anything, implies the following effect:

A general reduction of the existing duties on imports.

To be followed by a larger importation of foreign-made fabrics.

To be followed by a falling of in the demand for those made at home.

To be followed by the closing of American workshops.

To be followed by a relatively greater number of men engaged in agriculture.

To be followed by an increase in the supply of farm products, with no corresponding increase in the demand.

To be followed by a reduction of the farmer's profits.

I, for one, do not like it.

Perhaps some robust philosopher who raises theories instead of corn will rise in his place, on the call of States, and prove that Samuel Peebles doesn't know what he is talking about. Up to the present time, however, Mr. Peebles appears to have a clear majority in his favor.—*Philadelphia Press.*

ONE difficulty with tyros in the use of machinery is the wasting of oil by its too profuse use. It often happens that a bearing will heat when supplied with too much oil, that will run cool when supplied with the proper quantity. The reason is that when the lubricator is partly worn it becomes sticky; it resists removal; it remains tenaciously between the shaft and its bearings; whereas too much of it, usually thin and limpid, serves to "wash the bearing," and let the parts into closer contact.

To make rubber packing air and steam tight the packing is brushed over with a solution of powdered rosin in ten times its weight of stronger water of ammonia. At first, this solution is a viscid, sticky mass, which, however, after three or four weeks, becomes thinner and fit for use. The liquid adheres easily to rubber, as well as to wood and metal. It hardens as soon as the ammonia evaporates, and becomes perfectly impervious to liquids.

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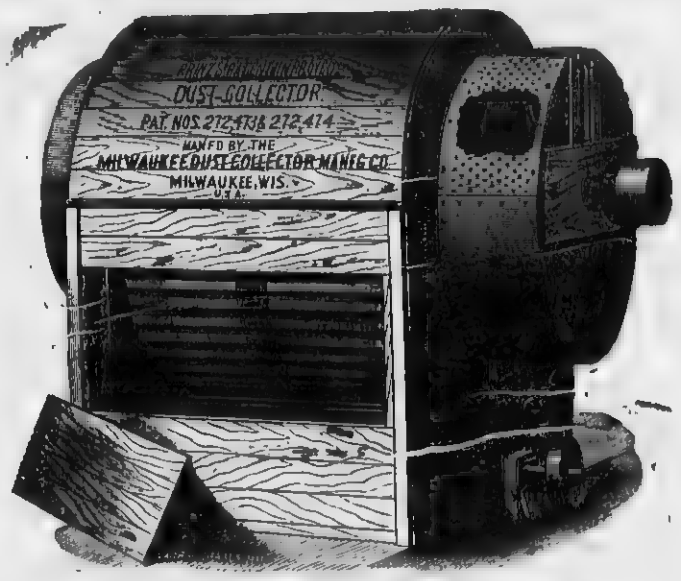

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TESTIMONIALS.

MINNEAPOLIS, MINN., April 2, 1883.

Milwaukee Dust Collector Mfg. Co.

GENTLEMEN: In reply to your request for our opinion of the merits of your dust collector, will say, we are using them on twenty purifiers and they ventilate perfectly and require no attention. We consider it the best dust collector in the market. Yours truly, J. A. CHRISTIAN & CO.

MINNEAPOLIS, MINN., April 2, 1883.

Milwaukee Dust Collector Mfg. Co.

GENTLEMEN: After a two months' trial of your dust collector we feel prepared to bear testimony to the value of your machine, and will say without exception it is one of the most satisfactory devices we have ever placed in our mill as a purifier and roller exhaust. Yours truly, CROCKER, FISK & CO.

MINNEAPOLIS, MINN., April 2, 1883.

Milwaukee Dust Collctor Mfg. Co.

GENTLEMEN: Yours of 30th ult. at hand. We say in reply, that we have six of your Prinz dust collectors in our mill, and they are giving best of satisfaction, doing all that you claim for them. We consider them the best dust collector in the market. Yours truly, D. R. BARBER & SON.

ROCHESTER, N. Y., April 17, 1883.

Milwaukee Dust Collector Mfg. Co.

GENTLEMEN: In reply to yours of the 14th inst., would say that the Prinz dust collectors in use in our A and B mills are giving excellent satisfaction, need very little attention, and do their work remarkably well.

Yours very truly, MOSELY & MOTLEY.

ST. LOUIS, MO., March 7, 1883.

Milwaukee Dust Collector Mfg. Co, Milwaukee,

GENTLEMEN: Yours of date Feb. 24 received, making inquiry as to how your dust collectors are working, would say they are giving us entire satisfaction. We are running twenty of them. * * * They give us no trouble.

Yours truly, KEHLOR MILLING CO.

JAMESTOWN, N. Y., April 27, 1883.

Milwaukee Dust Collector Mfg. Co.

GENTLEMEN: I have the dust collector that you shipped to D. H. Grandin, of this city, at work, and will tell you in this just what I think of it. I consider it the *most perfect* working machine that I ever saw; it has dispensed with the dirty dust room entirely. It takes the dust from 4 purifiers completely, and from 9 sets of single roller mills to a perfection. I cannot say enough in its praise, and feel sure that it has a future unequalled by any mill improvement of the age. I remain very respectfully yours, J. PHETTIPLACE.

MILWAUKEE DUST COLLECTOR MFG. CO., Milwaukee, Wis., U. S. A.

AMERICAN GRAIN TRADE FROM 1789.

To the Editor of BRADSTREET'S:

SIR—As supplementing my letter of April 21, giving a historical sketch of the British corn trade, I append a history of the grain trade of the United States from the adoption of the Constitution of 1789 to the present time.

The United States have always been, as they were in their colonial time, an exporting country of grain. The only marked exception to this was in 1886, when considerable quantities of wheat were imported. The small importation of 1857 and 1866 are too trivial to take into account. The normal position of this country, whether our crops are abundant or deficient, is that of an exporter of grain. So generally is this fact known that it has been remarked for many years by sea captains that one can purchase a barrel of American flour and pork at any port in the world.

It may be said England is the largest importer of grain and the United States is the largest exporting country. Within the last ten years the United States has completely outranked all other countries, including Russia. Previously to 1878 the latter had been at the head of the list.

Our power of producing grain has increased in a greater ratio than the growth of population during the last forty years. Our exports have been during the years ending June 30 as follows:

EXPORTS BREADSTUFFS.

Annual average of	*Wheat and flour in bushels.*	*Indian corn bushels.*	*Total grain, wheat&corn, bushels.*	*Bu'ls expo'd pr cap.*
5 y'rs ending 1845,	6,864,009	1,827,571	8,691,640	.45
5 y'rs ending 1850,	14,721,773	11,258,131	25,979,904	1.28
5 y'rs ending 1855,	16,438,919	5,914,495	22,353,414	.89
5 y'rs ending 1860,	23,517,982	6,810,521	30,328,503	1.06
5 y'rs ending 1865,	40,691,314	10,341,591	51,032,905	1.52
5 y'rs ending 1870,	27,860,488	10,682,672	38,553,060	1.00
3 y'rs ending 1873,	47,528,193	28,852 719	76,380,912	1.89
Year 1874.....	91,510,398	35,985,831	127,495,232	3.03
Year 1875.....	72 912,817	30,025,036	102,937,843	2.39
Year 1876.....	74,750,682	50,910,532	125 661,214	2.84
Year 1877.....	57,043,936	72,652,611	129,696,547	2.81
Year 1878.....	93,139,296	87,161,000	180,331,196	3.77
Year 1879.....	148,000,000	80,000,000	228,000,000	4.44
Year 1880	183,309,890	106,000,000	289,300,890	5.78
Year 1881.....	184,000.000	91,000,000	275,000,000	5.33
Year 1882.....	118,000,000	43,000,000	161,000,000	3.04

Nothing in the history of the commerce of nations exceeds this enormous increase of exports of breadstuffs during the last forty-two years. It is equal to an aggregate increase of 3,200 per cent., or, when the shipments are compared with the population, it is shown to have increased from forty-eight one-hundreths of a bushel to five and seventy-eight one-hundreths bushels per capita or 1,104 per cent. The causes for this wonderful development of of the export of breadstuffs are not difficult to find. The wonderful improvements made in this country in agricultural implements, in the plow, the cradle, etc., early in the century astonished Europe, and enabled this country to increase the production of grain. These improvements were followed by the opening of the Erie canal, which joined the waters of the ocean with thousands of miles of our great inland lakes. Thus the cost of production was lessened by labor-saving machines, and the cost of distribution was decreased by extended and cheapened waterways.

Greatly as the above increased the productive and distributive power of this country, it was a mere beginning. The steam railways which were begun about 1830 really did not make much progress until after 1850. Now they are extended over an immense extent of country, and carry the produce of the farmer to the seaboard summer and winter, unlike canal navigation which is closed five months in the year. To this must be added the improved reaper, the steam thresher and binder, and lastly the great improvements which have lessened ocean freights, the introduction of ocean steamers using the double-acting steam-engine. To all of these causes must be added the prosperity of England, our best customer, for the British empire is the purchaser of two-thirds of all our exports.

The following will show the increase of crops of wheat and Indian corn:

	Bushels— *Wheat.*	*Indian corn.*
Census 1840, crop 1839.....	84,823,272	377,531,875
Census 1850, crop 1849.....	100,485,944	592,071,104
Census 1860, crop 1859	173,104,924	838,792,740
Census 1870, crop 1869.....	260,146,000	874,320,000
Census 1880, crop 1879	448,756,080	1,754,861,535
Estimated crop of 1882.....	506,000,000	1,624,847,800

The increase of the crops of wheat and Indian corn since 1839 was 501 per cent. of the former, and 330 per cent. of the latter. The population has increased in a less degree since 1840, or about 212 per cent. This clearly accounts for the extraordinary exporting power of the country in cereals.

Here let us for a moment stop. Facts like these invite a consideration of the causes that have led to so great an increase in the cultivation of cereals during the last decade. Admitting that the leading interest of the country is agriculture, yet it must be allowed that our commercial and manufacturing interests are also of great importance. The latter pursuits being of a more speculative nature, apt to suit an enterprising and speculative people better than agriculture, yet it happens that in speculative times that the latter is neglected for the former. This has undoubtedly happened three times within fifty years—in 1837, 1857 and in 1873—and it may happen again when similar causes again appear. These causes are speculation and abuse of credit. In 1837 it was principally the abuse of credit in the shape of paper money; in 1857 it was bank discounts, or making credits in bankers' ledgers, falsely called deposits; in 1873 it was the increase of government and bank paper money beyond the amount of metallic money that would have been in circulation if government or bank notes had not been printed.

The sure sign of, and naturally one of the causes of agriculture being neglected, is the price of labor being above what the farmer can afford to pay his employes. The following table illustrative of this shows the price of white wheat in New York May 1, day wages of labor in gold, and its equivalent in bushels of wheat:

Annual average of	*White wheat per bush. gold.*	*Wages common laborer, daily, gold.*	*Equivalent bush. wheat for day's work.*	*Produce of acres wheat.**
9 years end'g May 1, '68...$1 61	$0.96	0.598	12.54
7 years end'g May 1, '75... 1.48	1.63	1.117	23 04
4 years end'g May 1, '79.. 1 51	0.97	0.676	13.69
2 years end'g May 1, '81.. 1.22	1.10	0.897	18.65
Year end'g April 1, '88... 1 25	1.60	1.200	24.00

*Average yield of fifteen bushels per acre required to pay one year's wages of a laborer.

Taking fifteen bushels of wheat as the yield in an average of years of one acre of land and computing the wages of labor in wheat, it made the farmer, at an average during seven years ending 1875, sell the produce of 88 per cent. more land to pay a year's wages of a common laborer than it did in the nine years ending 1868. It will be observed that the total of wages estimated in wheat for the period of four years ending 1879—the year of resumption of specie payments—declined nearly to that of the period ending in 1868. It will also be noticed that although agricultural labor is partly paid in board, that after due allowance for the latter the above quotations for labor are a fair average of what was paid in the State of New York.

I will further state that, like the period ending in 1837 the high wages paid by agriculturalists from 1868 to 1873, (which continued to 1875,) were the fruits of the abuse of credit and general inflation, causing the diversion of too much labor and capital from agriculture to speculative industries and railways—and that this was the sole cause of the commercial, manufacturing and railway collapse of 1873. It was the low price of labor and the numbers that were unemployed that forced the latter back to the cultivation of the soil during the six years ending 1879, together with a succession of good crops and with good demand for our cereals, owing to four deficient harvests in Europe. This caused the immense surplus of cereals and provisions to be taken at high prices. In other words, redundant labor from 1873 to 1879 caused the area of cultivation to extend at an unprecedented rate, which with the causes already stated, influenced foreign exchanges in our favor. This enabled the country to retain the produce of its mines of precious metals for six years, say to the amount of $200,000,000, and import a like amount of specie from Europe. There cannot be a doubt that our agricultural progress during the last decade repeated the story told just after 1837, that is, restored the prosperity of the country.

The question to be considered at present is whether we are not traveling the same road over again as during the five years preceding 1873. The fact that farm labor is high is evident, it requiring the produce of twenty-four acres of wheat to pay a common laborer for one year. This should cause people to reflect whether speculation in city buildings and railways is not drawing off too many hands from the land, as in 1837 and 1873. It is to be hoped that this rise in wages is due to material causes, such as good crops and labor-saving machines. The country is free of a redundant currency at present. Our paper money for three years has been stationary, thanks to the credit of the government enabling it to reduce the interest on its bonds, and making it unprofitable for banks to issue paper money against them. The issue of $75,000,000 of silver certificates against silver held by the government is only inflation to the extent that that silver is overvalued as coin 15 per cent., or about $11,000,000. I consider the silver bill, compelling the executive to coin not less than $2,000,000 of silver per month, dangerous, and sure, if long persisted in, to land us on a single silver standard. It is a stupid bill, for if it had never been enacted we would have shipped the $135,000,000 of silver as merchandise, and exchanges would have been in our favor to a like amount (less the overvaluation of silver as coin), and instead of that amount of silver dollars, we would have to-day about $115,000,000 more gold. It is therefore to be hoped that bankers and others will check speculation, and prevent too much capital being transferred from movable to permanent investments, and thereby prevent labor from being transferred unwisely from agriculture to a more speculative employment.

With respect to the price of wheat, I find for the twenty-five years ending 1845 the average price of wheat was about $1 per bushel. During this period the probibitory corn laws of the United Kingdom of Great Britain and Ireland were in full force. During the thirty years ending 1875 the average price of wheat for export was $1.33 per bushel. This advance of one-third in the value of wheat was undoubtedly owing primarily to the freedom of the corn trade inaugurated in England by Sir Robert Peel in 1846. When we consider the great improvement in labor-saving agricultural implements and cheapening of freights by the competition and extension of railways during this period, the great prosperity of our farmers is easily accounted for. The average price of wheat for seven years ending June 30, 1882, was about $1.19 per bushel. This decrease in price of 14c. per bushel is to be attributed largely to the heavy competition in freights between the railways and the lake and canal navigation. This reduced the expense of distribution and forwarding from the west to the seaboard nearly one-half.

As far as Indian corn is concerned, the average price at which it was exported for twenty-five years ending 1845 was 60½c. per bushel, and for thirty years ending 1875 about 75c. per bushel. The freedom of the grain trade in England not only contributed to the increase in the value of Indian corn, but the great reduction in England in the import duties on provisions had an important effect, as it improved the value of salt and fresh American meats, which is Indian corn in a concentrated state. The export value of Indian corn for seven years ending June 30, 1882, was about 60c.; this reduction, as stated of wheat, was due to lower freights.

The principal reasons for the larger rewards to labor and capital in the United States over those realized in Europe are, in the main, owing to the surplus of fertile land, where none but that which is first-rate is cultivated. Land may be considered as a gift by our Creator of so many natural machines for production of food, but land being of different degrees of fertility, may be classed as instruments of first, second, third and fourth rate power of production. The nations therefore which have a surplus of land will only cultivate the best, while nations densely populated will be compelled to use inferior lands. As a natural result, the wages of labor and profits of capital will be less among the latter nations. Hence in this country, land being redundant, is cheap, and labor dear, while land being limited in proportion to the population in Europe, is dear, and the wages of labor and the profits of capital low. To deny this would be to deny that labor and capital have continually gravitated from Europe to North America for about three hundred years.

It is therefore quite clear that it is our rich inheritance of a superabundance of fertile lands which causes labor to be remunerated better here than in Europe, and it is erroneous to think, as many do, that our prosperity is to be attributed to a high tariff. On the contrary, I think the latter acts in many instances as a bounty to transfer capital and labor from greater to less productive industries. I will therefore conclude by stating that if it is desired that our farmers shall sell their surplus to Europe to advantage, the duties on the goods we import from Europe must be modified, so as to better enable foreigners to purchase our cereals in return.

HENRY KEMP.

41 S. William St., New York, May 3.

THE ADVANTAGES OF TECHNICAL SCHOOLS.—The *United States Economist* opines that the active interest now being taken in England in developing technical education, must have an important bearing upon the future of manufactures elsewhere. This is a subject which should commend itself strongly to the attention and support of our people, because it will not do to be late in taking advantage of the leading element in the great problem of superiority in the higher branches of manufacturing industries. The practical education of the young in all the details that enter into the manipulation of raw materials must be of the greatest service, as it will develop a class of thoroughly trained experts, and lead to new and novel methods of treatment in the processes of manufacture. As wealth increases there will be a growing demand for new artistic productions, and of a class where excellence will be the controlling question, as far as price and fashion are concerned. For this reason no pains should be spared in providing technical schools in every section of our country, so as to popularize the study of a most useful and necessary science—for such it really is—and which is, at the same time, both practical and useful. Technical schools undoubtedly develop a fondness for the manipulation of the various raw materials coming under attention, and this must lead to a feeling of content among those who finally, from choice, choose to earn a livelihood amid the clashing machinery of the mill. The question of fixity of labor, combined with educated skill in the use of materials, is one of great interest to American manufacturers. In England, the development of this system of education appears to have been rapid of late, and will, unquestionably, make great progress in the future. Anything that tends to raise the standard of manufactures at this time has a special value, for the reason that the best products command the best prices; being in increasing demand, and to secure fine manufactures, it is necessary to have skilled operatives of the best class.

A CARD.

From Stout, Mills & Temple—Livingston vs Odell.

We notice an article in the *Commercial Gazette* of May 8, under the heading of "Happy Millers," giving the substance of a conversation by a party of millers at the Board of Trade meeting, the day previous, in which the decision of the U. S. Supreme Court in the case of Downton vs. The Yaeger Milling Company was a topic of discussion. In the course of this conversation, the Livingston and Odell controversy was also alluded to, and it was remarked that Odell had obtained judgment against Livingston, which, were it true, would involve Stout, Mills & Temple, who are the sole manufacturers of the Livingston Roller Mill. We saw by the tenor of this conversation, that the gentlemen, including the reporter of the *Commercial Gazette*, present at said meeting, did not understand the nature or scope of the Livingston and Odell controversy, and this reply is intended to set both of them and all others interested aright on the subject. A false impression has been made in the minds of the millers of the country, all of which has grown out of an interference before the Commissioners of Patents in regard to the priority of invention of two minor points, both of which were claimed by both Livingston and Odell. These disputed points have, for several months, been discarded by Stout, Mills & Temple, and different and better ones substituted. It is not our purpose to go into the details of this subject, but only to correct a false impression which has unquestionably been made to prevent, as far as possible, the sale of Livingston mills. A great deal of coloring has been given to this interference case, and we here say for the information of all concerned that no one need have any fears of the Odell party, as we are not using any device on the Livingston Roller Mills, which is the property or patent of the said party. Further, no judgment has been rendered against us, and none can be. There is not a device in connection with the Odell mill that we want or would use if offered to us as a gift. The manufacture and sale of gradual reduction roller mills is part of our business, and we believe we shall get a fair proportion of business done in this line of mill machinery and can obtain it by fair and legitimate means, instead of frightening millers into purchasing by threats of suits if they purchase any other. We prefer to sell upon the merits of our own production rather than upon the demerits of others. In conclusion, we would say to any and all mill-owners using the Livingston roller-mills to pay no attention to threats and pay no royalty to any one for the use of the Livingston Roller Mills. WE STAND BY OUR FRIENDS.

STOUT, MILLS & TEMPLE, Dayton, O.

No reflection whatever is cast upon the millers or reporter, as they have been misinformed.—*Cincinnati Commercial*, May 15.

IT is better to have too great a boiler capacity than too little. There are but few mills and factories using steam power that do not grow in their demand for power beyond the initial expectations. Most first-class engines are so proportioned that, providing the necessary amount of steam is obtainable, they can be run with very fair economy and safety to a power considerably higher than that for which they were originally designed.

ENGINEERING.

BY R. H. THURSTON, C. E.

In the address before the American Society of Mechanical Engineers, Prof. R. H. Thurston, of the Stevens Institute, Hoboken, N. J., and President of the Society, gave a *resume* of the progress which mechanical engineering is making in this country, from which we take the principal points.

In the handling of metal, said President Thurston, we have still much to learn. The weakness of the large sections of metals necessarily used in our heavier work still remains a serious evil, and our inability, especially when using steel, to secure the highest tenacity of the metal is a standing reproach to our profession. I have had occasion to test hundreds, yes, thousands, of samples of iron and steel during the last few years, and have never yet found a maker able to give equal tenacity in large and small sizes. This difficulty seems particularly serious in dealing with forged iron built up of scrap, and with heavy sections of any kind of steel. I find iron carrying 75,000 pounds per square inch in No. 8 wire, 55,000 in inch bars, and falling to 40,000, or even 35,000, in heavy engine-shafts and beam straps. Steel varies still more seriously. It is to be hoped that, with the more general use of ingot metal, the introduction of hydraulic forging, and of improved methods of heating and handling, so as to avoid the introduction of many small parts in building up large masses, or frequent exposure to high temperatures in the process, this element of cost and danger may, in a measure at least, disappear.

The great testing machine at Watertown Arsenal is constantly at work, under the direction of Colonel Daidley, sometimes for private and sometimes for public benefit, and has already done some extremely valuable work in that important and unexplored field, the investigation of the strength of large sections and parts of structures. Its most valuable work is done intermittently, and its usefulness is far less than it should be and would have been had its original purpose been adhered to. There seems no immediate prospect of the resumption of the great work organized in 1875, and planned and commenced by the Government Board.

The petitions of this society, of the Society of Civil Engineers, of the Institute of Mining Engineers, of the Iron and Steel Association, of the faculties of the leading technical schools and colleges of the United States, and of business men and other private individuals of all classes, with all the influence that they could command, separately or collectively, have been inadequate to secure the restoration of that Board, or the creation of a similar organization, or the resumption of the great work barely planned and begun by the old Board.

This fact is as suggestive of the necessity of a movement on the part of the business men of the country for the purpose of securing some influence in its government as it is remarkable as illustrating their utter impotence to-day. Meantime, the Ordnance Bureau of the Army has a small appropriation for use in this direction, and we shall look with hopeful interest for results.

But "Iron, tough and true, the weapon, the tool, and the engine of all civilization," as Theodore Winthrop calls it, is now fairly displaced by its younger rival, "mild steel," or more exactly, "ingot" or "homogeneous" iron.

For all shapes that can be rolled this revolution is accomplished, and, in forged work of small size, the change is hardly less complete. This is especially true of railroad work, and not only rails, tires, and axles, bolts, rivets and boiler plate are becoming common in steel, but piston and connecting rods, all forged parts of the valve gear and minor parts of the engine, are now made in this tougher, stronger, and more uniform and reliable metal.

The introduction of the basic process—tardy as it is—by cheapening the stock of the steel-maker, and the steadily increased familiarity of makers and users with the characteristics of the new metal and with the requisites for the successful manufacture of demanded grades and better qualities, will undoubtedly, before many years, make its use so general that puddled and forged iron will become almost or quite unknown in our art. The growth of pneumatic steel manufacture in this country during the past ten years has been most remarkable. In 1870 we were making somewhere about 20,000 tons, in 1873 about 160,000 tons, and to-day are turning out 1,750,000 tons; while the price has fallen below the finer brands of iron.

A few years ago—even those among us whose hair has hardly begun to gray can remember the time—no engineer except Telford with his proposed cast-iron bridge of 600 feet span, dared present plans of iron truss or arched bridges of 300 feet span; and Roebling was the only engineer bold enough to attempt much greater spans even with suspension bridges.

To-day with improved material and the better knowledge of their quality that comes of intelligent inspection and systematic test, we think little of trusses of 500 feet span or suspension bridges of 1,000 feet and more; and it is even proposed to bridge the Forth at its expansion into the Frith with a steel truss bridge a mile long, containing two main spans of 1,700 feet each. Not the least remarkable and—to those who pay taxes in New York or Brooklyn to defray the cost of the "East River" bridge—interesting fact in connection with this scheme is that it is expected to cost but about $7,500,000. Who shall say that we are not making progress in this direction at least?

The reduction in the cost of purer, stronger, tougher, and more homogeneous grades of so-called "steel" which are to take the place of iron in the near future, and of those which are made by the "open hearth process" especially, will depend principally upon the introduction of the regenerative type of furnace, the great invention of that greatest of metallurgical engineers, our colleague Siemens, and of the lesser inventors who have followed his lead. With this furnace supplying a means of attaining any desired temperature with a pure mild flame and at a wonderfully low cost of production, we are able to produce the boiler steels and similar metals with an economy that permits competition in this field with even the product of the Bessemer process. With the closed furnace, the attainable temperature is only limited by the temperature of fusion of the materials of the furnace. Could a new and sufficiently refractory furnace material be found, it might possibly be able to compete with the electric furnace of Siemens, or with the electric arc with which our colleague Farmer, that Nestor among our electricians, claims long ago to have produced the diamond. The melting of platinum in considerable quantities by Ricketts is now a familiar fact, and is an earnest of what may be expected in the more ordinary departments of metallurgy when such enormous temperatures shall be found manageable.

We are not yet absolutely free from annoyance by the presence of air cells and minor defects in these "ingot irons" as they are properly called; although such defects have ceased to be dangerous or in any way very serious. Capt. Jones' method of compressing the solidifying ingot by steam pressure, and other devices in imitation of his are giving us a very homogeneous metal.

Singularly enough, our people, enterprising as we are accustomed to consider ourselves, have not yet made use of the Whitworth system of compression of steel, notwithstanding the fact that its value has been known so many years, and through the wonderful strength, uniformity, and toughness conferred by it have made "Whitworth compressed steel" famous throughout the world. Abroad, its use is extending, and guns, screw shafts, and other heavy "uses" are often made of it. The venerable inventor informs me that he is preparing plans that will enable even large castings of peculiar shapes, as screw propellers to be made of this material. Some dozen years ago, studying this method and its results, partly for my own satisfaction, and partly to obtain material for a report to the Navy Department, I was greatly impressed with its efficiency as even then developed, and its work has since been wonderfully extended and its value correspondingly increased.

Our system of inspection and test of materials, of parts and of structures are steadily assuming satisfactory shape, and are becoming very generally, almost universally, adopted in all important work, whether public or private, and it will soon be the exception rather than the rule that supplied material or constructions of whatever kind are purchased without a careful determination of their fitness for their intended purpose.

In my last address, I referred very briefly to the modern method of manufacturing machinery in quantity for the market as distinguished from the old system, or lack of system, of making machines. This method compels the adaptation of special tools to the making of special parts of the machines and the appropriation of a certain portion of the establishment to the production of each of these pieces, while the assembling of the parts to make the complete machine takes place in a place set apart for that purpose.

This requirement, in turn, makes it necessary that every piece, and every face and angle, and every hole and every pin in every piece shall be made precisely of this standard size, without comparison with the part with which it is to be paired, and this last condition compels the construction of gauges giving the exact size to which the workman or the machine must bring each dimension.

Finally, in order that this same system, which has introduced such wonderful economy into the gun manufacture, into sewing machine construction, and into so many other branches of mechanical business, may become more general, and in order to secure that very important result, a universal standard for gauges and for general measurement, we need an acknowledged standard for our whole country, one that shall be an exact representation of the legal standard measure, and one which shall be known and acknowledged as such, and as exactly such.

It could hardly be expected that private enterprise would assume the expense and take the risk involved in this last work. Such work has heretofore only been done by governments. Yet among our colleagues are found the men who have had the intelligence, the courage and the determination to accept such risks and to meet such expense, and the men who have the knowledge and the skill needed in doing this great work. I think that report of our committee on gauges, and the paper of our colleague, Mr. Bond, will show that this great task has been accomplished, and we shall find that we are indebted to the Pratt & Whitney Co., to Prof. Rogers, and to Mr. Bond, for a system of measurement and a foundation system of gauges that will supply our tool makers and other builders with a thoroughly satisfactory basis for exact measurement and for accurate gauging.

It is encouraging to observe that this subject is attracting the attention of men of science, and that so distinguished a body as the British Association for Advancement of Science is taking action regarding it.

Design is to-day conducted systematically and with scientific adaptation of means to ends. The day of the *soi distant* inventor by profession has gone by, and the educated and trained designer has usurped his place. Reuleaux's kinematic synthesis determines the form to be taken by the machine when once the object sought in its construction is plainly defined, and an intelligent application of the laws and data of strength of materials gives its parts their safest and most economical forms and proportions.

The process of invention thus becomes a scientific one, and the inventor himself, instead of blindly groping for or guessing at results, is seen intelligently creating new and useful forms, and is now entitled to claim the higher credit and the nobler distinction that we gladly accord to him who performs so high an order of intellectual work, and to none more cheerfully than to him who applies the grand science of engineering to production of new forms of mechanism.

As in the fine arts the great painter is known by his success in composition and in form rather than in color, so in our own art the best work is that which is distinguished by excellence and of general design, of arrangement of detail and of proportion, while aimless ornamentation has no place. This characteristic of true art will become more fully illustrated as the scientific method of invention and design gains ground. The most direct and simple adaption of means to end will always be the object sought by the engineer, and the labors of one of our honorary members, Dr. Reuleaux, have led to the development of a scientific method of discovering those means.

In the steam engine practice, we are now advancing rapidly. The introduction of the "drop cut off," in 1841, by Sickles; of the now standard type of automatic valve gear, in 1849, by Corliss; of the high-speed engine twelve years later, by Allen and Porter; of the combined advantages of jacketing, superheating and reheating; and the definite acceptance of the compound engine in later years, still constitute the complete history of modern steam engineering; but we are, nevertheless, continually gaining a knowledge of the best methods of handling higher steam; of attaining higher piston speed; of securing greater immunity from cylinder condensation and leakage; and of providing against other causes of waste. We are just beginning to perceive what principles must govern us in the endeavor to secure maximum commercial efficiency, and how economy in that direction is affected by the behavior of steam in the cylinder, and by the mutual relations of all the various expenditures that accompany the use of steam power.

The young Perkinses are still leading in the practice of carrying high steam, and make 400 pounds per square inch—27 atmospheres—a usual figure, while they are experimentally repeating the work of the elder Perkins, and of Dr. Albans, of forty years ago, working steam at 1,000 pounds or nearly 70 atmospheres.

Unfortunately, the gain to be anticipated by the use of these enormously increased pressures does not seem likely to be very great, unless some decidedly less wasteful kind of engine can be devised in which to work it. The Anthracite, with steam at 800 pounds and upward, was less economical in fuel than the Lelia, carrying about one-third that pressure. Emery has stated that a limit seems to be found at about 100 pounds to economical increase of pressure; and Stevens finds a limit, due to the character of the indicator diagram, inside of 250.

One of the most interesting and curious as well as important deductions from the rational theory of engine efficiency is the existence of an "absolute limit to economical expansion—lying far within the previous accepted limit—due to the fact of increase of cylinder condensation and waste with increase in the ratio of expansion, which places an early limit to the gain due expansion *per se*. It seems possible, if not certain, that this point is often actually reached in ordinary engines within the range of customary practice.

All these facts combined point to a probability that we have little to hope for in the direction of increased steam engine economy with our standard machinery. Change in the directions that I have already so often indicated are evidently to be our sole reliance—changes limiting loss by cylinder condensation. Probably the surrounding of the working fluid by non-transferring surfaces is our only resource, in addition to, or in substitution for, the now well understood expedients of high piston speed and superheating. Until that is done, steam jacketing remains a necessary and unsatisfactory method of reducing losses. With a non-conducting cylinder, were it procurable, we might secure very nearly the efficiency of the ideal engine, friction aside, as it would be a "perfect engine," and no natural limit would then exist to increasing economy. Were this accomplished, we might at once reduce the cost of steam power by about one-half in our best engines, and to probably one-fourth or one-fifth of the present in ordinary machines.

In steam engineering, both physicists and engineers are more than ever attracted to the study of those phenomena which produce the familiar and enormous differences, even in the best practice, between the thermodynamic and the actual efficiencies of engines. The subject lies in that "marchland" territory between science and practice, which few of the profession can explore from both sides, and it has remained less known than it would otherwise be were it either a matter of purely physical science or of practical experience. Fortunately, we are likely soon to see it thoroughly studied. The debate which arose not long since between Zeuner, the distinguished physicist, as a representative of pure science, and Hirn, the no less distinguished engineer, as an experienced practitioner and skillful experimentalist, in which the differences, to which I have so often called attention, of fifty per cent. or more between the "theoretical" efficiency and the actual performance of the best steam engines seem for the first time to have been given prominence in Europe, has led to much closer study of the matter than could possibly otherwise have been brought about.

On this side the Atlantic, the discussion of steam engineering efficiencies has been carried on earnestly, if not always with that knowledge that should precede criticism, and it is to be hoped and anticipated that the engineer may ere long be put in possession of possible facts and real knowledge that may aid him in so designing and so applying this greatest of modern inventions as to attain the *maximum maximorum* of economy.

Ten years ago, nearly, I took occasion to state, in a report to the President of the United States on the exhibited machinery of the Vienna exhibition of 1873, printed later with the other reports of the United Scientific Commission, that "The changes of design recently observed in marine engines, and less strikingly in stationary steam engines, have been compelled by purely mechanical and practical considerations. The increase noted in economy of expenditure of steam and of fuel is, as has been stated, due to increased steam-pressure, greater expansion and higher

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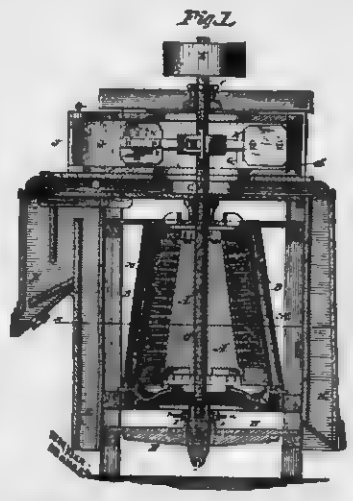

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Picks will be sent on 30 or 60 days' trial to any responsible miller in the United States or Canada, and if not superior in every respect to any other pick made in this or any other country, there will be no charge, and I will pay all express charges to and from Chicago. All my picks are made of a special steel, which is *manufactured expressly for me* at Sheffield, England. My customers can thus be assured of a good article, and share with me the profits of direct importation. References furnished from every State and Territory in the United States and Canada. Send for Circular and Price List.

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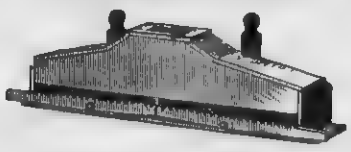

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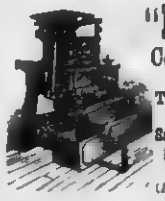

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Millers and Grain Buyers can secure agency for the above goods (it will prove a profitable agency, free from risks, and will increase your trade with farmers) by writing to **THE AULTMAN & TAYLOR CO.,** MANSFIELD, OHIO.

Address, TAYLOR MFG. CO.

(*Please Mention this Paper.*) Chambersburg, Pa.

piston-speeds, with improved methods of construction and finer workmanship. These several directions of change occur simultaneously, and are all requisite. To secure maximum economy for any given steam-pressure, it is necessarry to adopt a certain degree of expansion which gives maximum economy for that pressure under the existing conditions.

'This point of cut-off for maximum efficiency lies nearer the beginning of the stroke as steam-pressure rises. For low pressure a much greater expansion is allowable in condensing than in non-condensing engines; but, as pressure rises, this difference gradually lessens. For example, with steam at 25 pounds by gauge, the best economical results are obtained when expanding about three times in good condensing engines and about one and a half times in non-condensing engines. With steam at 50 pounds, these figures become five and two and a half, respectively; and at 75 pounds, the highest efficiency is secured in condensing engines, cutting off at one-fifth, and in non-condensing engines with cut off at one-third stroke.

'Owing to the decreasing proportional losses due to back-pressure and to retarding influences, the departure from the economical result indicated for the perfect engine becomes greater and greater, until, at a pressure of between 200 and 250 pounds, the proper point of cut-off becomes about one-sixth or one-seventh, and very nearly the same for both classes of engines, and the increase of efficiency by increase of pressure and greater expansion becomes so slight as to indicate that it is very doubtful whether progress in the direction of higher pressure will be carried beyond this limit.'

These conclusions were derived from careful observation of the performance of unjacketed "single cylinder" engines, and a comparison of the ratios of expansion of those exhibiting greatest economy. It is interesting to note that later and probably more reliable methods of comparison than were then familiar go far in confirmation of the opinion then expressed. I think that I have been able to prove the existence, as just stated, of an 'absolute limit of economical expansion,' which, whatever the ratio of steam pressure to back pressure, in all ordinary heat, engines probably fall within the range of familiar practice. Advance beyond the best efficency of to-day in ordinary engines seems likely to be very slow and not at all likely ever to be very great.

Extended experiments will be needed to secure all the facts demanded by the designing engineer, and to furnish constants for the approximate theory of the efficiency, which only is, as yet, his sole guide. An exact theory is one of those things for which he hopes, but which he does not expect soon to see. Some experiments have already been made, but they contribute only the first step. Those made by order of the Navy Department, and principally by Isherwood, and those of Hirn have hitherto been our sole guide, but a new line of more direct investigation of the laws governing internal, or cylinder, condensation has been inaugurated by Escher, of Zurich, and we are able to see a fair prospect of obtaining definite information in this direction.

Escher finds, in the case taken by him, that this waste varies nearly as the square root of the period of revolution and of the pressure, and is nearly independent of the back pressure—conclusious which are especially interesting to me as corroborating assumptions, based on general observation and non-experimental practice, made by me previously in developing an empirical system of design.

In steam boiler engineering, the only observable change seems to be the slow but steady gain made in the introduction of water-tube coil boilers and sectional boilers, and in the extension of a rational system of inspection and test while in operation. To-day, the intelligent owner of boilers secures inspection and test, with insurance, by intelligent engineers and responsible underwriters, as invariably as he obtains inspection and insurance of his building. Under this system, steam boiler design, construction, and management is becoming a distinct art, based upon real knowledge. The system of forced circulation proposed by Trowbridge, and, perhaps, others, seem to me likely to prove useful in the solution of the problem to-day presented.

Work on the Halliday mill at Cairo, Ill., is rapidly progressing under the superintendence of Mr. J. M. Patrick. Messrs. Edw. P. Allis & Co., of the Reliance Works, Milwaukee, Wis., are furnishing forty pairs of rolls in Gray's noiseless belt frames, together with other special machinery, and are doing all the iron work. Messrs. Halliday Bro's do nothing by halves, and the mill, when completed, will be first class in every respect.

NEWS.

B. F. Boorman, miller, at Waukesha, Wis, has failed and made an assignement.

B. Savage & Son, Alton, Iowa, have lately started up their mill on the Case system.

The John T. Noye Mfg. Co., of Buffalo, N. Y., is putting in another machine for corrugating rolls.

James Duttons flour mill at Vermillion, Ill., burned May 19. Loss $12,000. Insurance $6,000.

O. Lewis, Auburn, N. Y., has just placed his order with Stout, Mills & Temple for Livingston roller mills.

Stout, Mills & Temple of Dayton, O., shipped to S. W. Morrison, Evans, Col, 2 pairs of Livingston rolls.

Henry Temple, St. Louis, Mo., is just in receipt of Livingston rolls from Stout, Mills & Temple, Dayton, O.

The Case Mfg. Co., Columbus, O., have the order of S. T. Gibson, Wakeman, O., for one Case centrifugal reel.

Stout, Mills & Temple have just shipped D. Keefer Milling Co., Covington, Ky., Livingston rolls, 9 x24, smooth.

W. J. Patterson, New Philadelphia, O., has left his order with Stout Mills & Temple for 1 double Livingston mill.

Greaves & Ruff of Kingsville, Mo., have an order with Stout, Mills & Temple of Dayton, O., for Livingston rolls.

J. W. Emison & Co., New London, Mo., are now running their mill on the Case system of gradual reduction.

The Case Mf'g. Co., Columbus, Ohio, are furnishing Geo. Hyatt, Washington, Ind., with some new machinery.

Moore & Rayburn of Kansas City, Mo., have an order for Livingston rolls with Stout, Mills & Temple of Dayton, Ohio.

The Case Mf'g. Co., Columbus, Ohio, are furnishing J. M. Piaszek, Valley Falls, Kans., with a line of breaks and rolls.

The Eureka Manf'g. Co., of Rock Falls, Ill., have placed in the Alton Roller Mill Co, of Alton, Ill., a Becker wheat brush.

The Eureka Manf'g. Co., of Rock Falls, Ills., have lately shipped a Becker wheat brush to Steel & Harris, of Albion, Ill.

The Case Mnf'g Co., Columbus, Ohio, are furnishing Wm. Sharaga & Co., Pomona, Ill., with some new machinery.

The Case Mf'g. Co., Columbus, Ohio, are furnishing Courtney & Wood, Kiosisville, Ohio, with some new machinery.

The Case Mnf'g. Co., Columbus, Ohio, are furnishing Baldwin & Osborn, Waupaca, Wis., with some new machinery.

The Case Mf'g. Co., Columbus, Ohio, have the order of G. Wilkie, Lexington, Wis., for a line of breaks, rolls and purifiers.

Smith, Lawther & Co., Nickerson, Kans., will start up their mill in a short time on the Case system of gradual reduction.

Scott & Buel, Union City, Mich., are putting in some new machinery furnished by the Case Mf'g. Co., Columbus, Ohio.

The Case Mnf'g. Co., Columbus, Ohio, have the order of Bailey & Rush, Marengo, Ia., for one "Little Giant" break machine.

R. Hannon & Co., Wall Lake, Iowa, has placed his order with the Case Mfg. Co., Columbus, O., for some new machinery.

The Case Mfg. Co., Columbus, O., have an additional order from J. A. Noggle, Lodi, O., for one "Case centrifugal reel.

Jas. Wagner & Co., of San Francisco, Cal., is putting in a machine for cutting rolls. The John T. Noye Mfg. Co, will furnish it.

Stout, Mills & Temple of Dayton, O., have just placed in the mills of Simon Gebhart & Son, Dayton, O., 6 pairs of Livingston rolls.

P. C. McGammon, Mt. Vernon, Ind., will use 2 double Livingston mills, from Stout, Mills & Temple, Globe Iron Works, Dayton, O.

Badger & Henry, Sharpsburg, Ky., have lately started up their mill on the Case system of gradual reduction with the best of results.

U. F. Beaumetz, Berea, O., has placed his order with the Case Mfg. Co., Columbus, O., for break machine, scalper, centrifugal, &c.

Chas. Pigler, of Sumpter, Minn., has instructed The John T. Noye Mfg. Co., of Buffalo, N. Y. to ship him a single Stevens' roller mill.

Ballard & Ballard, Louisville, Ky., have placed an order with The John T. Noye Mfg. Co., Buffalo, N. Y., for a double Stevens' roller mill.

J. N. Shanwholger, Manito, Ill., has filed and order with The John T. Noye Mfg. Co., Buffalo, N. Y., for a double Stevens' roller mill.

Hardesty Bros., Columbus, Ohio, are putting in a double Stevens' roller mill to be furnished by The John T. Noye Mfg. Co., of Buffalo, N. Y.

Fred. Schumacher, of Akron, Ohio, has sent in an order to The John T. Noye Mfg. Co., of Buffalo, N. Y. for a double Stevens' roller mill.

P. L. & J. B. Shusse of Stoners Pa., have placed an order with The Jno. T. Noye Mfg. Co., Buffalo, N. Y., for a double Stevens roller mill.

Stout, Mills & Temple, Dayton, O., will furnish Wm. Huckaby, Paola, Ks., Livingston roller mills and machinery for remodeling their mill.

Gratiot Mf'g Co. Chicago, Ill., have placed their order with Stout, Mills & Temple, Dayton, O., for three double sets Livingston roller mills.

Geo. Millbank Chillicothe, Mo., has salted an order for an additional Stevens roller mill (9x30) with the Jno. T. Noye Mfg. Co., Buffalo, N. Y.

Stout, Mills & Temple of Dayton, O., have the contract for the rolls to be used by James McMillen & Son, Jamestown, O., in their new mill.

Louis Emery, Jr., Three Rivers, Mich., has lodged an order with The John T. Noye Mfg. Co., of Buffalo, N. Y., for a double Stevens' roller mill.

Jno. G. Schaupp, Grand Island, Neb., has filed an order with The John T. Noye Mfg. Co., Buffalo, N. Y., for a four break Rounds' sectional roller mill.

Neevins & Padawilts, Grand Rapids, Wis., have placed an order with The John T. Noye Mfg. Co., of Buffalo, N. Y., for twelve pairs of Stevens' rolls.

G.F. Arvedson, Carpentersville, Ill., has lodged an order for ten pairs Stevens' rolls and other machinery with The John T. Noye Mfg. Co., of Buffalo, N Y.

Leach & Reasner, Halstead, Kans., want to be among the prospering millers, and have decided that they can be by changing their mill to the Case system of gradual reduction. They have placed their order with the Case Mf'g. Co., Columbus, Ohio, for a full line of breaks, rolls, purifiers, centrifugals, scalpers, etc., for a complete gradual reduction mill.

Sprague & Perfect, Marysville, O., are putting in the gradual reduction system, using five double sets Livingston belted mills.

A Becker brush, made by the Eureka Manf'g. Co., of Rock Falls, Ill., has been placed in J. A. Vernon's mill, at Hamburg, Penn.

The Case Mf'g. Co., Columbus, Ohio, have been ordered to send J. R. Sechler, Sechlerville, Wis., one "Little Giant" break machine.

Roots & Co., Cincinnati, Ohio, have ordered two more 9x18 double break machines from the Case Mf'g. Co., Columbus, Ohio.

Thos. Hamilton, Union Mills, Ind., has just placed his order with Stout, Mills & Temple, Dayton, O., for two pairs of Livingston rolls.

Schoelkopf & Mathews of Buffalo, N. Y., has placed an order for a large sized dust collector with the Milwaukee Dust Collector Mfg. Co.

The Case Manf'g. Co., Columbus, Ohio, have the order of J. F Katterjohn, Boonville, Ind., for two pairs Case rolls, with automatic feed.

The Case Mnf'g. Co., Columbus, Ohio, have the order of Hugh Sproul & Co., Boyers, Pa., for one pair bran rolls with patent automatic feed.

The Case Mnf'g. Co., Columbus, Ohio, have an order from D. Shepp, Tamaqua, Pa., for one reducer and scalper, making three separations.

W. H. Hamond, Springfield, Mo., has just placed an order with Stout, Mills & Temple of Dayton, O., for 3 double sets of Livingston rolls.

The Case Mf'g. Co., Columbus, Ohio, are furnishing I. G. Stembenner, Platteville, with one pair smooth rolls, with patent automatic feed.

Stout, Mills & Temple, Dayton, O., are furnishing W. C. Mansfield, Cleveland, Tenn., Livingston roller mills and machinery to remodel his mill.

The Jewell Milling Co. of Brooklyn, N. Y., are putting in the Prinz Dust Collectors as fast as time allows. They intend abolishing the dust room.

Bottkoll Bro's of Brussels, Wis., will use Livingston rolls in their new mill at Ahnapee, Wis., from the works of Stout, Mils & Temple, Dayton, O.

Thos. Moses, Sharon, Pa., will change his mill to the gradual reduction system using Livingston roller mills, from Stout, Mills & Temple, Dayton, O.

Knollenburg & Wavering, of Quincy, Ill., wishing to do first-class work, have bought a Becker brush from the Eureka Manf'g. Co. of Rock Falls, Ill.

J. M. Shirk, of Mt. Carroll, says he wants the best brush made, and accordingly, orders a Becker brush, made by the Eureka Manf'g Co., of Rock Falls, Ills.

F. & H. Fries of Salem, N. C., has placed an order with The Jno. T. Noye Mfg. Co., of Buffalo, for a Rounds sectional and a double 9x15 Stevens roller mill.

Stout, Mills & Temple, Dayton, O., have received orders from Phœnix Fdry & Mach. Co. of Terre Haute, Ind., for four double sets of Livingston finishing rolls.

Cooper Mf'g Co., Mt. Vernon Ohio, have recently placed orders with Stout, Mills & Temple of Dayton, O, for two full lines of Livingston mills, 10 double sets.

Wehrman & Koelling, of Truxton, Mo., have lately overhauled their mill and put in a Becker brush, made by the Eureka Manf'g. Co., of Rock Falls, Ill.

W. T. Pyne, of Louisville, Ky., has placed an order with The John T. Noye Mfg. Co, of Buffalo, N. Y., for a double Stevens' roller mill for J. E. Mills, Greenville, Ky.

Mast, Troyer & Co., of Buena Vista, Ohio, not wishing to be behind the time, have put in a Becker wheat brush, made by the Eureka Manf'g. Co. of Rock Falls, Ill.

A single Stevens roller mill will go to Toledo, O., to be furnished by The Jno. T. Noye Mfg. Co., of Buffalo, N Y., upon the order of Barney & Kilby of Sandusky, O.

The Case Mfg. Co., Columbus, O., have the order of J. Blank, Sycamore, Ill., for breaks, rolls, purifiers, scalping reels, etc., for a reduction mill on the Case system.

J. A. Blythe, Orleans, N. Y., has just placed his order with Stout, Mills & Temple, Dayton, O., through their agent, Chas. Rakes, for two pairs of Livingston rolls.

H. S. Challis, of Wetmore, Kans, has improved his cleaning machinery by putting in a Becker wheat brush, made by the Eureka Manf'g. Co., of Rock Falls, Ill.

The Case Mf'g. Co., Columbus, Ohio, have the order of John Spencer, Barrington, Wis., for one "Little Giant" break machine and scalper, making three separations.

Mark Evans has ordered three pairs of the celebrated Stevens' rolls for a mill in Fort Worth, Texas. The John T. Noye Mfg. Co, of Buffalo, N. Y. will fill the same.

The Case Mf'g. Co., Columbus, Ohio, have the order of Michael Kennedy, Des Moines, Iowa, for break machine and smooth and corrugated rolls, for germ and bran.

The Case Mnf'g. Co., Columbus, Ohio, have an additional order from G. W. Nicewanner, Piqua, Ohio, for one four-roller, "Bismarck" mill, with patent automatic feed.

A. M. Hull, Ithaca, N. Y., has placed an order with The John T. Noye Mfg. Co., of Buffalo, N. Y., for a Rounds' sectional roller mill and two double Stevens' roller mills.

J. & S. Emison, Vincennes, Ind., has filed an order with The Jno. T. Noye Mfg. Co., of Buffalo, N. Y., through Jno. Webster, Detroit, Mich., for six pairs of Stevens rolls.

Jesse Barlou of Phelp, N. Y., will place in his mill a Rounds sectional and a double Stevens roller mill all to be furnished by the Jno. T. Noye Mfg. Co., Buffalo, N. Y.

A. W. Martins, of Goodville P. O., Pa., has planted an order with The John T. Noye Mfg. Co., Buffalo, N. Y., for a Rounds' sectional roller mill and a single Stevens' roller mill.

Capt. E. W. Pride, of Neenah, Wis., has forwarded to The Jno. T. Noye Mfg. Co., Buffalo, N. Y., an order for nine Stevens roller mills for Frank Koenig, Watertown, Wis.

Bailey & Rush, Marengo, Iowa, are putting one 9x18 double "Bismarck" Roll, with patent automatic feed for bran and tailings, from The Case Mf'g. Co., Columbus Ohio.

Stout, Mills and Temple of Dayton, O., have just contracted with Wood & Co., Harvard, Ill., for a complete roller mill, using Livingston rolls and S., M. & T. bolting chests.

A. Dehuer & Co., the well known millfurnishing house of St. Louis, are placing a large number of orders with the Milwaukee Dust Collector Mfg Co., for Prinz dust collector.

James Mc. Grew, Kankakee, Ill., has contracted with Stout, Mills & Temple of Dayton, O., for one six-break Gilbert combined mill, 9 x 24 inch rolls and Livingston finishing rolls.

Messrs. Warwick & Justus of Massilon, O., have let the entire contract for rebuilding their mill to a complete roller mill to The Jno. T. Noyo Mfg. Co, of Buffalo N. Y. Eighteen pairs of Stevens rolls as well as other first class machinery will be employed, all under the direction of J. S. Karns.

The new mill now building at Grand Rapids, Mich., by Messrs. C. G. A. Voigt & Co., will have a complete outfit of Allis rolls in Gray's noiseless belt frames—twenty-six pairs in all.

Stout, Mills & Temple of Dayton, O., have the contract for remodelling D. Scott's mill, Macomb, Ill., using the Gilbert combined mill for breaks, and Livingston finishing rolls.

Holliday Bros., of Cairo, who have the largest and best mill in the State, are putting in one of the largest size Becker brushes, made by the Eureka Manf'g. Co., of Rock Falls, Ill.

W. N. Hoorver, of Oskaloosa, Iowa, after looking into the merits of all the brush machines, concludes he wants a Becker brush, made by the Eureka Manf'g Co., of Rock Falls, Ill.

The Case Mf'g. Co., Columbus, Ohio, have the order of M. J. Bowley, Fort Worth, Texas, for one "Little Giant" break machine and scalper combined, making three separations.

Among other exhibits in the great R. R. Exposition, opened at Chicago, May 24th, was an 18 x 48 Reynolds-Corliss engine from Edw. P. Allis & Co's Reliance Works Milwaukee.

L. W. Rathbun of Rochester, N. Y., has sent in an order to The Jno. T. Noye Mfg. Co., Buffalo, N. Y., for a Rounds sectional and a double Stevens roller mill for a mill at Clyde, N. Y.

When finished and fully equipped with its housing, pulleys, etc., it assumed such huge proportions that the men who put it up dubbed it "Jumbo," after Barnum's big elephant.

Jones & Co. of New York are operating the Prinz Dust Collectors on their purifiers rollers exhaust and grain cleaners. They require only a few more machines to do away with the dust room.

Jno. Webster, the irrepressible John, has gobbled an order from F. Goodnow & Co., Salina, Kas., for nineteen pairs of Stevens rolls to be furnished by the Jno. T. Noy Mfg. Co., of Buffalo, N. Y.

The Case Mnf'g. Co., Columbus, Ohio, have been ordered to ship the Odessa Mill Co., Odessa, Mo., one four-roller "Bismarck" mill for bran and tailings, and one Little Giant Break Machine.

Chas. Heuber of St. Louis, Mo., has sent in an order to The Jno. T. Noye Mfg. Co. of Buffalo, N. Y., for ten pairs of Stevens rolls to be furnished for the mill of Estel & Weinbold, at Wittenburg, Mo.

N. L. Walker, Nicholson, Pa., is putting in his mill a Rounds' sectional roller mill and a single detached mill all with Stevens' dress, and to be furnished by The John T. Noye Mfg. Co, of Buffalo, N. Y.

Jac. Amos & Sons who own and operate the splendid mill at Syracuse, N. Y., have ordered an additional double Stevens roller mill, to be furnished by the Jno. T. Noye Mfg. Co., Buffalo, N. Y.

The Atlas Milling Co. of Buffalo, N. Y., are giving their mill a general over-hauling under the skillful hands of Ed. Brown, Jr., and The John T. Noye Mfg. Co. Ten pairs of Stevens' rolls will be used.

The Case Mf'g. Co., Columbus, Ohio, have been ordered to ship Kloose & Bradford, Creston, Iowa, one "Little Giant" break machine and scalper, making three separations, to go in front of their burrs.

Jno. Webster, of Detroit, Mich., has scooped an order from Newton, Miller & Emmons, Robinson, Ill., for thirteen pairs of Stevens rolls to be furnished by The Jno. T. Noye Mfg., Co, of Buffalo, N. Y.

Again Pyne, (W. T.) of Louisville, Ky. is heard from This time he places an order with The John T. Noye Mfg. Co., of Buffalo, N. Y., for a double Stevens' roller mill for J. T. McKenzie, of Louisville, Ky.

The Newport Oil Mf'g Co., of Newport, Ark., have placed their order with Messrs. Edw. P. Allis & Co. of the Reliance Works, Milwaukee, Wis., for a 16 x 42 Reynolds-Corliss engine, for their works at that place.

Pray Mf'g Co of Minneapolis, Minn., have just placed their order with Stout, Mills & Temple, Dayton, O, for three car loads (21 double sets) of Livingston roller mills for their many customers in the Northwest.

The Case Mfg. Co. have been awarded the contract of Fisk & Silliman, Ashtabula, O., for a full line of breaks, rolls, purifiers, scalping reels, centrifugal reels, etc., for a full gradual reduction mill on the Case system.

Wood, Morrell & Co., Johnstown, Pa., are about to change to rolls, and have sent The John T. Noye Mfg. Co. of Buffalo, an order for fifteen pairs of the celebrated Stevens' rolls, mounted in the improved frames.

The Spaulding Elevator and Construction Co., will build a 30,000 bushel elevator at Eau Claire, Wis., this summer. The Randall elevator has been purchased by parties who will immediately turn it into a flouring mill.

Nine pairs of 18 and 30 inch Stevens rolls furnished by The Jno. T. Noye Mfg. Co. of Buffalo, N. Y., upon the order of Chas. Heuber of St. Louis, Mo, the milling expert, will go into the mill of Weinhold & Son, at Frohna, Mo.

The millers generally throughout the country are adopting the Prinz dust collectors and abolishing the old fashioned dust room. This keeps the Milwaukee Dust Collector Mfg. Co,s shops on a full run all the time.

Ira Wescott, superintendent of the Jno. T. Noye Mfg. Co., of Buffalo, N. Y., has secured an order and is making plans for an all roller mill for James Lawson at Thorold, Ont, sixteen pairs of the celebrated rolls will be used.

L. V. Rathbull, Gen'l agent for the sale of Stevens' roller mill has placed an order with The John T. Noye Mfg. Co., of Buffalo, N. Y., for another Rounds' sectional roller mill and two single mills all with Stevens' corrugations.

The Case Mfg. Co., Columbus, O., have taken the contract of Dennis & Slough, Westerville, O., for a full line of breaks, rolls, purifiers, scalping reels, centrifugal reels, etc., for a full gradual reduction mill on the Case system.

The Case Mnf'g. Co., Columbus, Ohio, have been awarded the contract of Woods, & Dunlap, O'Fallen, Mo., for a full line of breaks, rolls, purifiers, centrifugal reels, etc., for a full gradual reduction mill, on the Case system.

Charles Huber, the St. Louis, Mo. Hungarian milling engineer has secured an order from Moening & Wettin, of Quincey, Ill., for three double Stevens' roller mills to be furnished by The John T. Noye Mfg. Co., of Buffalo, N.Y.

At White Pigeon, Mich., the mill of David P. Hamilton will soon undergo a rapid transformation from a stone to a full grown roller mill, by the hands of The John T. Noye Mfg. Co., Buffalo, N. Y., the veteran mill builders.

Messrs. Barton, McCortle & Co., of Cumberland, O., have determined to adopt the roller system and for that purpose have placed an order with The John T. Noye Mfg. Co., of Buffalo, N. Y., for five pairs of Stevens' rolls with latest devised frame.

W. F. Kerdolf, Esq., Lexington, Mo., recently gave Messrs. Edw. P. Allis & Co. of Milwaukee, Wis., an order for a Gray's noiseless belt roller mill.

Messrs. Turner & Reynolds, Stanton, Mich., recently ordered a Gray's noiseless belt roller mill from Messrs. Edw. P. Allis & Co. of the Reliance Works, Milwaukee, Wis.

Messrs, Edw. P. Allis & Co. of the Reliance Works, Milwaukee, Wis.' recently received an order for a Gray's noiseless belt roller mill from Mr. W. S. Hall, Steele City, Neb.

Messrs. Richards & Butler, Indianapolis, Ind., are rebuilding the mill of C. F. Moore, Waveland, Ind., and are putting in a full outfit of Allis rolls in Gray's noiseless frames.

Messrs. Yoe & Clark, La Crosse, Wis., lately ordered 4 pairs of Allis rolls in Gray's noiseless belt frames from Messrs. Edw. P. Allis & Co. of the Reliance Works, Milwaukee, Wis.

The Gratiot Mf'g Co. of Chicago, Ill., recently ordered four pairs of Allis rolls in Gray's noiseless belt frames from Messrs. Edw. P. Allis & Co., Milwaukee, Wis., for Mr. R. Bishop, McHenry, Ill.

Messrs. Chisholm Bro's & Gunn, Minneapolis, minn., recently ordered of Messrs. Edw. P. Allis & Co. of the Reliance Works, Milwaukee, Wis., 15 pairs of Allis rolls, all in Gray's noiseless belt frames.

The Lacroix Middlings Purifier Co. of Indianapolis, Ind., are remodeling the mill of Messrs. Long & Co., Russellville, Ky., and are putting in a full line of Allis rolls in Gray's noiseless belt frames.

Messrs. Wilford & Northway, mill furnishers, Minneapolis, Minn., are remodeling the mill of Messrs. Moenning Bro's, Quincy, Ill., and are putting in 14 pairs of Allis rolls in Gray's noiseless belt frames.

Messrs. H. B. Phillips & Co., Lebanon, Ky, lately placed their order with Messrs. Edw. P. Allis & Co. of the Reliance Works, Milwaukee, Wis., for 14 pairs of Allis rolls all in Gray's noiseless belt frames.

Messrs. Hiestand & Cowman of Hillsboro, Ohio, have contracted with Messrs. Edw. P. Allis & Co. of the Reliance Works, Milwaukee, Wis., for the outfit of roller mills and machinery for their new mill.

Messrs. Zimmerman & Harter, Sedalia, Mo., are improving their mill, and have placed an order with Messrs. Edw. P. Allis & Co. of the Reliance Works, Milwaukee, Wis., for a Gray's noiseless belt roller mill.

Messrs. Edw. P. Allis & Co. of the Reliance Works, Milwaukee, Wis., recently received an order from Silas Barkley, Hulmeville, Pa, for 7 pairs of the celebrated Allis rolls in Gray's noiseless belt frames.

Mr. J. Klingersmith, Kittanning, Pa., is remodeling his mill, and has placed his order with Messrs. Edw. P. Allis & Co. of the Reliance Works Milwaukee, Wis., for 6 pairs of Allis Rolls inGray's noiseless belt frames.

The La Croix M. P. Co. of Indianapolis, Ind., have placed an order with Messrs. Edw. P. Allis & Co. of the Reliance Works, Milwaukee, Wis., for a Gray's noiseless belt roller outfit for Messrs. Carroll & Nelly.

Another Rounds' sectional roller mill for Penn. has been ordered for the mill of Jos. Oberholzer, at Spring Grove mills. The John T. Noye Mfg. Co., of Buffalo, N. Y. will fill the order, a single smooth roller mill will accompany it.

The Case Mnf'g. Co., Columbus, Ohio, have been awarded the contract of A. L. Jacobs, Pana, Ill, for a full gradual reduction mill, on the Case system, [illegible] line of their breaks, rolls, purifiers, scalping reels, etc., etc.

The Case Mf'g. Co., Columbus, Ohio, have been awarded the contract of Geo. A. Klinglar, St. Charles, Mo., for a full line of breaks, rolls, purifiers, scalping reels, centrifugals, etc., for a full gradual reduction mill on the Case system.

Messrs. Sooy, Brinkman & Roberts, Great Bend, Kas., are putting in a 16 x 42 Reynolds-Corliss engine to take the place of a 12 x 36 Reynolds-Corliss, in order to give additional power for a proposed increase in the capacity of their mill.

R. J. Patton is building a new gradual reduction mill on the Case system at Meers, Ohio, he has placed his order with the Case Mf'g. Co., Columbus, Ohio, for a full outfit of breaks, rolls, purifiers, centrifugal reels, scalping reels, etc.

Messrs. Chisholm Bro's & Gunn, Minneapolis, Minn., recently placed an order with Messrs. Edw. P. Allis & Co. of the Reliance Works, Milwaukee, for a 14 x 42 Reynolds-Corliss engine for the new mill they are building at Aberdeen, D. T.

The Case Mf'g. Co., Columbus, Ohio, are furnishing Patterson & Donleary, New Philadelphia, Ohio, whith a full line of breaks, rolls, purifiers, scalping reels, centrifugals, etc, etc., for a full gradual reduction mill on the Case system.

Jas. Wagner & Co., of San Francisco, Cal., the largest mill furnishing establishment on the Pacific coast has ordered of the John T. Noye Mfg. Co., Buffalo, N. Y., two Rounds' sectional roller mills, both with the celebrated Stevens' corrugations.

Messrs. W. Bell & Co., Millbrig, Ill., and T. Cottingham of Benton, Wis., have contracted with the Iowa Iron Works Mill Building Co. of Dubuque, Iowa, for remodeling their mills; they will each use a full line of Allis rolls in Gray's noiseless belt frames.

Messrs. Goold & Shaw have just completed building their new 100 barrel, steam power flour mill at Aledo, Ill. It is on the Case system of gradual reduction and gives great satisfaction. E. M. Warfel is head miller and Andrew Olsen, engineer.

P. J. Snyder, of Williamsville, N. Y., has determined to put in break rolls and has placed an order for a Rounds' sectional roller mill having Stevens' corrugations, scalpers and elevators complete. The John T. Noye Mfg. Co., of Buffalo, have the order.

Dayton, O., May 24, 1883.—Stout, Mills & Temple of Dayton, O, have an order from Bennett Smith & Co., Emlenton, Pa., for one 9 x 18 six-break Gilbert mill, and two pairs of Livingston finishing rolls, through their agent, Chas. Rakes of Lockport, N. Y.

Stout, Mills & Temple of Dayton, O., received the contract for rebuilding Kirk & Kirk's mill, Port Clinton, O., on the gradual reduction system. They will use 1 six-break Gilbert mill and Livingston finishing rolls, with S. M. & T.'s bolting chests, etc.

Messrs. E.F. Schatzer & Co. are doing quite an extensive business in the mill furnishing line at present, and recently ordered a Gray's noiseless belt roller outfit from Messrs. Edw. P. Allis & Co. of the Reliance Works, Milwaukee, Wis., for a job they have in construction.

F.S. Nichols, at Newark, N.Y., has determined to yield to the roller boom and has filed an order with The John T. Noye Mfg. Co., Buffalo, N. Y., for a Rounds' sectional roller mill and a double detached mill with the necessary machinery to alter his mill to a roller mill.

Mr. Ed. Zahn, Burlington, Wis., visited Milwaukee recently, and after a careful investigation, placed his order with Messrs. Edw. P. Allis & Co. of the Reliance Works, for one of their new four-break reduction machines and 4 pairs of Allis rolls in Gray's noiseless belt frames.

Messrs. Commings & Allen, Akron, Ohio, have taken out the last run of stone in their mill and substituted therefor a double 9 x 18 porcelain roller mill, in Gray's noiseless belt frame. The same was furnished by Messrs. Edw. P. Allis & Co. of the Reliance Works, Milwaukee, Wis.

W. T. Pyne of Louisville, Ky., has his hands full of work and reports a large increasing trade. He has recently taken a contract for putting a Rounds' sectional roller mill in the mill of Wm. Cuddick, Grand View, Ind. The John T. Noye Mfg. Co., Buffalo, N. Y. will furnish same.

R. G. Shuler & Co., of Minneapolis, Minn., have in structed The John T. Noye Mfg. Co., of Buffalo, N. Y., to ship them to Lisbon, D. T., for a mill they are building at that point a Rounds' sectional roller mill and four pairs rolls in separate frames, all with the Stevens' corrugations.

Mathias Blumer, La Crosse, Wis., after personally investigating the different systems of gradual reduction, left his order with the Case Mf'g. Co., Columbus, Ohio, for a full line of breaks, rolls, purifiers, scalping reels, centrifugals, etc., for a full gradual reduction mill, on the Case system.

The Garden City Mill Furnishing Co. of Chicago, recently placed orders with Messrs. Edw. P. Allis & Co., of the Reliance Works, Milwaukee, Wis., for a Gray's noiseless belt roller mill for J. M. Hadley, De Soto, Kas. Also a Gray's noiseless belt roller mill for Henry Colstein, Raselle, Ill.

Messrs. Seiberling Bro's of Akron, O., have contracted with Messrs. Edw. P. Allis & Co., Milwaukee, for a 26 x 48 Reynolds-Corliss engine to drive their new flouring mill, This engine, with the pair of 22 x 48 in the new Schumacher mill, will give the Reynolds-Corliss a good representation in Akron.

Messrs. Edw. P. Allis & Co. of the Reliance Works, Milwaukee, Wis, are building a 32 x 60 Reynolds-Corliss engine, to furnish motive power for the Southern Exposition at Louisville, Ky. Visitors to the Exposition who are interested in steam power, will find much about this engine to interest them.

Messrs. Edw. P. Allis & Co., Reliance Works, Milwaukee, Wis., are furnishing the roller mills, centrifugal reels, Gray purifiers, etc., for the addition to the Camp Springs mills at St. Louis, Mo., and are putting in thirty pairs of rolls in Gray's noiseless belt frames, making fifty-six pairs in all, in their complete mill.

W.F. Snook, formerly head miller for Messrs. Commings & Allen at Akron, Ohio, has entered into partnership with the National Mill and Elevator Co. at Parsons, Ka's, and is remodeling their mill to the roller system. Messrs. Edw. P. Allis & Co. of the Reliance Works, Milwaukee, Wis., are furnishing the entire outfit of rolls and machinery.

The new mill now building by Messrs. J. K. Mullen & Co., Denver, Col., will be driven by a 26 x 48 Reynolds Corliss engine, condensing; from the Reliance Works of Messrs. Edw. P. Allis & Co. of Milwaukee, Wis. Messrs. Allis & Co. also have contract for all of the roller mills, special machinery and Iron work for this mill.

There will be used six double and one single Stevens' roller mill, two Martin centrifugals, Richmond brand[illegible] ters and brush machines, two flour packers, three [illegible]th purifiers, Moline separators, suitable scalpers and bolting arrangements to constitute a first-class mill. Mr Hamilton has long been an enterprizing citizen of that place and never fails to respond to the demands of human progress.

The following well known mill furnishers have lately sent in their orders for the Becker wheat brush, made by the Eureka Manf'g. Co. of Rock Falls, Ill.:

E. P. Allis & Co., Milwaukee, Wis,; Nordyke & Marmon, Indianapolis, Ind.; B. F. Gump, Chicago, Ill.; Todd & Stanley Mill Fur. Co., St. Louis, Mo.; Great Western Mfg. Co., Leavenworth, Kans., A. Dehner & Co., St. Louis, Mo.; Whitmore & Binyon, London, England; Oscar Oexle & Co., Augsburg, Germany.

Stout, Mills & Temple of Dayton, O., now have their Gilbert combined mills working successfully in the following mills: Haskell, Cornell & Co., Toledo, O.; Willey & Moore, Lockport, N. Y.; H. L. Wetherald & Son, Connersville, Ind.; Bennett Smith & Co., Emlenton, Pa.; Jost Durst & Son, Dayton, O.; Kisser&Pierson, Ottumwa, Iowa; and are now placing them in the mills of Cuyahoga Forge & Iron Co., Cuyahoga Falls, O; Schwarting & Co., Wolcott, Iowa; James McGraw, Kankakee, Ill.

The Goshen Ind. Milling Co. have quite recently consumated a contract with The John T. Noye Mfg. Co, of Buffalo, N. Y., to re-build and re-furnish their mill at that place, giving it a capacity of two-hundred barrels in twenty-four hours. Eight double Stevens' roller mills will be employed, as well as five Smith purifiers, suitable and sufficient cleaning machinery, bolting capacity, &c., to constitute an A 1 mill. The work will be under the charge of N. W. Holt, the milling engineer connected with the above Co.

Stout, Mills & Temple, Dayton, O., have just received an order from Tho's Tyson of Melbourne, Australia, for 1 of their 36-inches American Turbines. They also have orders for their celebrated wheels from Union Mill Co., Waterloo, Iowa; E. P. Allis & Co., Milwaukee, Wis.; Ja's Rutherford, Bristol, Tenn.; Herr & Cissel, Georgetown, D. C.; Cha's Rakes, Lockport, N. Y.; Rock River Paper Co., Beloit, Wis.; Kimberly, Clark & Co., Neenah, Wis.; Minneapolis Mill Co., Minneapolis, Minn.; Bullard & March, Chagrin Falls, O.; Eau Clair Brush Electric Co., Eau Clair, Wis.; O. E. Merrill & Co., Beloit, Wis., Stormont Silver Mining Co., Silver Reef, Utah.

A Large Four Roller Mill. The Case Manufacturing Co., of Columbus, O., have just shipped to Geo. O. Baker & Co., Selma, Ala., a 4-roller corrugated reduction mill of unusual dimension and capacity. The purpose to which it is to be put being out of the usual order required that the mill be of more than ordinary strength and weight. The rolls were 9x30 inches and corrugated for the purpose intended; the frame of the mill was solid iron, tight rigid and very strong; the bearing for the rolls were 10 inches in width and the journals 3¼ inch steel and 10½ inches long; the pulleys were 19 inches in diameter and 8 inch face. The mill was built throughout with the greatest care and in the most thorough manner, it was an enlargement of the "Bismarck" pattern built by the Case Company and was of course furnished with their famous Automatic feed.

Stout, Mills & Temple of Dayton, O., have recently finished 8 complete gradual reduction roller mills situated as follows: A 150 bbl. mill (24 hours,) owned and operated by J. W. Harsteman, Harstemanville, O., about three miles northeast of Dayton. It has been in successful operation for three weeks, giving the very best results. The power is furnished by three American turbines under 10 feet head, regulated by a Fruen governor. There are 12 pairs of Livingston rolls; 2 flour packers; and one wheat separator on the first floor. The cleaning machinery is in the basement and can be stopped and started by a friction clutch. Above the grinding floor there are 11 flouring reels; 8 scalping reels; two centrifugals; 5 purifiers; and 1 bran duster. The mill was planned and programed by Mr. Jno. Livingston, and the millwright work was done by Frank Peffer both with Stout, Mills & Temple. All the machinery and furnishings were from the works of the same firm. This is a model mill, both in plan and workmanship, and well worth the attention of enquiring millers in that section of the country. Another model mill, but using a different plant, also built by Stout, Mills & Temple, or rather remodelled, is that of H. L. Wetherald & Son, Connersville, Ind. It is a merchant mill, of 150 bbl. capacity. The wheat breaks and separations between the same are made, and bran finished for duster by a six-break Gilbert combined mill 24 rolls. The reduction of middlings and finishing is done on four pairs of Livingston rolls. They have 13 flouring reels; 2 centrifugals; and 5 purifiers with packers; and cleaning machinery. They have been running up to full capacity ever since starting, and getting highest prices for their flour in eastern markets, in competition with the best mills in the country. This mill was programmed by Mr. Livingston also. The third mill referred to is that of Kiser & Pierson, Ottumwa, Iowa. It has just been completed, and started up and is now running up to full capacity, 125 bbls. 24 hours. They use a Garden City break machine for first break. The next four reductions, including scalping and aspirating after each, are made by a four-break Gilbert combined mill—18-inch rolls. The bran is finished (sixth break) and middlings reduced on Livingston rolls. They use 12 bolting reels, 2 centrifugals and 5 purifiers, with necessary cleaning machinery, packers and furnishings. The mill was planned and built and machinery and machines furnished (except first-break machine) by Stout, Mills & Temple, and promises to be another monument to commemorate their skill as mill builders. This firm is now building three more mills complete, viz: Schwarting & Co., Wolcott, Iowa; Wood & Co., Harvard, Ill.; Kirk & Kirk, Port Clinton, O. The first 125 bbl. capacity and the two latter 100 bbl.

THE OPENING OF THE GREAT BRIDGE.

The great suspension bridge between New York and her chief suburb, Brooklyn, has been formally opened for traffic, thus signalizing the completion of one of the most remarkable engineering works undertaken in this country. This great work has been for so many years in course of construction, having been frequently delayed and postponed for financial and other reasons, that residents of the metropolis have for years past been accustomed to speak of its completion as an event that might happen some time in the indefinite future. But there must be an end to all things, and the great bridge, that has been the innocent cause of any amount of municipal discord, and that has cost many millions more than was originally contemplated, is finished at last. The formal ceremonies of the opening of the bridge for traffic on May 24th, were highly impressive.

As a matter of record, we present herewith, in condensed form, a history of this remarkable structure: The East River bridge has been constructed by the cities of New York and Brooklyn, through a commission appoint[illegible] the purpose by the authorities of the two cities. It originated, however, in private enterprise, a company having been organized in 1867 under the authority of an act of the Legislature to construct a bridge between the two cities. After the work, however, had been fairly started the company resigned its enterprise to the two cities, as above stated.

The great structure, which may be ranked with the greatest engineering works of the world, was designed by the late John A. Roebling (who unfortunately lost his life through an accident while engaged in the work of fixing the location of the Brooklyn tower), and was constructed under the direction of his son, Washington A. Roebling, as chief engineer. In May, 1869, a commission of three United States engineers was appointed by the War Department to report on the plans of Mr. Roebling, and especially to determine the question as to whether or not the bridge would be an obstruction to navigation. The government engineers approved the plan, but recommended an increase of five feet in hight.

Operations were actually undertaken on January 3d, 1870, when the work of preparing the site of the foundation of the Brooklyn tower was commenced. From that time the work, notwithstanding many vexatious delays, was steadily prosecuted until its completion—a period of about thirteen years.

The actual cost of the bridge, including the cost of the site, will be about $15,500,000, an amount considerably greater than the original estimates. The Brooklyn terminus is near the junction of Fulton and Main streets, and the New York terminus is on Chatham street near the City Hall. The total length of the bridge, including approaches, is 5,989 feet. The towers are 276⅜ feet in hight, and the clear span between them is 1,595½ feet. The bottom of the bridge at the center is 135 feet above high-water mark. The supporting cables, four in number, and composed of a number of steel strands, are 15¾ inches in diameter, and are anchored inland at a distance of 930 feet back from the towers on each side. The anchorages are solid cubical structures of stone masonry, measuring 119 by 132 feet at the base and rising some 90 feet above high-water mark. Their weight is about 60,000 tons each.

The roadway of the bridge rises from the towers at an elevation of 118 feet above high-water mark, in an easy curve to the center of the span, where it meets the cables at an elevation of 135 feet. The frame-work of the bridge floor consists essentially of two systems of steel girders at right angles. The roadway is 85 feet wide, and is divided into five parallel avenues. The two outside avenues, which are devoted to vehicles, are each nearly 19 feet wide. The central avenue, which is intended for pedestrians, is 15½ feet wide, and is elevated 12 feet above the others. The two intermediate avenues between the wagon-ways and central pathway, and separated therefrom by vertical trussing, are to be occupied by a tramway, on which cars will be run in opposite directions. The motive power employed will be a stationary engine located on the Brooklyn side, operating an endless wire rope.

These details will give our readers who have had no opportunity of seeing it, a general idea of this masterpiece of engineering skill, which will be ranked among the great engineering works of the world.

Minneapolis stands first, St. Louis second, and Milwaukee third, in the manufacture of flour in the United States.